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ABSTRACT

The problems examined during this investigation consisted of the development of data acquisition and instructional systems, (1) to collect reliable data to assess the management system's actual performance and its acceptability by trainees, (2) to manage a variety of available resources, (3) to schedule trainees' activities, and (4) to monitor each trainee's progress. Nineteen elementary education students participated in a three-week trial of an individualized instructional curriculum. Their activities included selection of tasks and resource options, teaching concepts to local school children, taking quizzes both manually and via a teletype terminal, and entering data associated with all these activities at an on-line teletype terminal. It was found that non-computer trainees oriented could enter quality data with a minimum amount of preparatory training. Some further generalizations are made based on the data gained regarding modifications necessary to make the system operational. Based on the prototype model hardware, software, and personnel requirements of the operational model are projected with their respective costs. The management system's interface with the total university information system is discussed. An appendix contains data samples and a reference list. (Author/JY)

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TECH REPORT

EMPIRICAL DEVELOPMENT OF A COMPUTER MANAGED INSTRUCTION SYSTEM FOR THE FLORIDA STATE UNIVERSITY MODEL FOR THE PREPARATION OF ELEMENTARY SCHOOL TEACHERS

Edward Newton Hobson

Tech Report 8
April 27, 1970

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Nineteen elementary education students participated in a three-week field trial of an individualized instructional curriculum similar to that which is proposed for the operational model program. Their activities included the selection of tasks and resource options, the teaching of

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concepts to local school children, the taking of quizzes both manually and via a teletype terminal, and the entering of data associated with all these activities at an on-line teletype terminal.

The on-line data-collection system consisted of a KSR-35 teletype terminal connected to an IBM 1400 computer which was located about one-fourth of a mile away. This data acquisition system was utilized to collect thousands of individual data elements, some of which were data on the trainees' progress while others were trainees' individual responses to computer-administered tests and questionnaires. During the field trial, it was found that non-computer oriented trainees could enter quality data with a minimum amount of preparatory training.

The following generalizations, based on empirical data from computer records and quiz and questionnaire responses, may be made: (1) a computer managed instruction system is technically feasible for use with approximately 1,000 trainees; (2) the volume of data expected to be generated by the model requires computer processing for trainee scheduling and testing as well as overall program management, (3) projections of student loads and operational components for the computer system have been redefined, and (4) technical problems associated with the development and implementation of an on-line data acquisition and computer management system appear to be minimal. Based upon the successful implementation of the prototype model and the data collected in that effort, hardware, software, and personnel requirements of the projected operational model are made with their respective costs. Further, the management system's interface with the total university information system is discussed.

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(Publication No.)

Edward Newton Hobson, Ph.D.
Florida State University, 1970

Major Professor: Walter Dick

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CHAPTER I

INTRODUCTION

Background and Problem

While computers have had a significant impact upon our society as a whole in recent decades, they have had relatively little impact upon education. As the need for educational change becomes apparent, it is appropriate to examine the newer technological advances in terms of their relevance and applicability to current and future demands upon our educational system. The recognition that current educational practices had not been successful in equiping large segments of our population with the knowledge and skills for economic self-sufficiency or in maximizing the development of their human potential and the further recognition that the greatest educational impact could be made on young children culminated in the initiation of a new Elementary Teacher Education Development Program. This program was instigated by the Bureau of Research of the United States Office of Education in 1967. After several conferences, a request for proposals was issued for this program which later became the Comprehensive Undergraduate and Inservice Teacher Education Program for Elementary Teachers. In response to this request, 80 proposals were received by the U. S. Office of Education (Silberman & Kooi, 1969).

The receipt of 80 proposals indicated that many institutions, agencies and foundations, both public and private, were concerned with

the development of instructional systems that would meet the needs of larger segments of our population during the next decades. One of these institutions expressing such concern was the Florida State University. An interdisciplinary task force prepared a proposal which was submitted by the Department of Elementary Education of the College of Education. While the need to redesign the elementary teacher education program had been felt at the Florida State University for some time, this program initiated by the U. S. Office of Education accelerated the efforts to meet this need when the Florida State University's proposal, and a subsequent one, was selected to receive financial support for planning (Phase I) and feasibility (Phase II) studies. During the feasibility phase, Florida State conducted a field study of some of the conceptualizations which had been proposed in their original planning study.

The Florida State University model for instruction of the elementary school teacher trainees was conceptualized and developed in an environment which recognized the need to make the preparation and training of these school teachers more relevant and practical. In this model trainees were to perform a series of tasks, some of which required a satisfactory performance on a sequence of related tasks while other tasks or groups of tasks were quite independent of each other. Each task had several objectives with two or more enablers associated with each objective. Further, each enabler offered the trainee a different medium by which he could prepare himself to perform a whole task in an acceptable manner. Essentially the model allowed for self-pacing and the freedom of choice

concerning the number and type of enablers the trainee would undertake. The dependent, interdependent, and independent relationships which certain tasks had with each other, as well as the variety of alternatives available to each trainee, resulted in a multidimensional situation which brought together questions involving many things such as resource allocations, trainee's schedule, the rate at which trainees could proceed through various tasks, and the relationship which this rate of progress had to different trainee profiles.

The planning model of the future elementary teacher training program held that the massive quantities of data, which a commitment to individualized instruction requires, could be handles only by taking advantage of the potential power of computers (Sowards, 1969). Therefore, a computerized management control system was conceptualized which would make access to information possible for faculty, trainees, counselors, administrators, and researchers.

The problem under investigation for this dissertation was found in the computerized management control system of the Florida State University's conceptual model for training elementary school teachers, and it later became a part of the planned three-week field study. The problem consisted of (1) collecting reliable enabler and task data for trial assessment, projections, research, simulation, and program budgeting; (2) managing enabler resources; (3) scheduling of trainees; and (4) monitoring of each trainee's progress. To manually collect and manage the mass of detailed data which would be generated would have required a large clerical

staff for only a few dozen trainees. However, if a reliable method for collecting these data could be devised and tested during the field study, the feasibility of a major element of the conceptual model would have been demonstrated. Hence, the problem of this investigation was to implement and demonstrate, if possible, a feasible computerized management control system for the Florida State University's model.

Significance of the Problem

Preparation of elementary school teachers is only one element of the educational programs offered in the Florida State University's College of Education; and the programs offered by this college, both graduate and undergraduate, comprise just one of the major divisions of the total university. Consequently, the model for training elementary school teachers under development has considerable significance for projections to larger student groups within the college and university. Other educational programs may be able to draw from the data and documentation of the field study and from the implementation stages of this model in the development of even more sophisticated instructional systems better suited to their own needs.

Imbedded in this model for training elementary school teachers was the concept of individualized instruction. This concept basically represents the philosophy of making assignments of future learning activities for trainees based upon each individual's characteristics and his more recent performances. The options available to the trainee provide for self-pacing. The model was designed so that trainees who differed markedly in critical characteristic attributes

would be advised to proceed by way of diverse paths in the attainment of the same objective. Conversely, similar paths were the recommended route to the same objective for those who had similar characteristics and performances. Individualizing instruction, as herein descri'ed, is a rather advanced system of instruction combining the freedom of choice with counselor assistance and/or guidance in the selection of tasks, enablers, and options.

In the development of any new instructional model, consideration must be given to the existing environment of the institution within which the model will reside. In the case at hand, the elementary model had to interface with the informational system of the total university. Such interaction had to be capable of transferring data to and from the model into the mainstream of data collection and processing which generates files and produces reports for trainees, faculty, and administration. In this context, several questions had to be answered which related to the identification and coding scheme capable of providing suitable interface connections as well as being acceptable to all parties involved. Therefore, the elementary model was considered as a subsystem of instruction in the College of Education at the Florida State University; and, likewise, the computerized management control system was regarded as a subsystem of the elementary teacher training model.

The future success of any full implementation of the development effort invested in the Florida State University Elementary Education Trainee Model would depend heavily upon this subsystem to manage the vast quantities of data. Some of these data manipulated

by the computerized management control system during the field study were associated with resource alternatives available for each enabler, test results, trainee profile data, times required to complete tasks, sequencing of tasks, and the number of times a trainee received a performance evaluation for a given task. These data were voluminous and would have been almost unmanageable in a manual operation for the 19 trainees of the field study, and certainly out of the question for up to 1,000 trainees which this model is expected to accommodate. Because individualization of instruction with manual record-keeping activities would deluge teachers and/or counselors with an overload of clerical work, a computer to manage these data, in essence, became the essential cohesive communication link which would permit various components of the model to operate in an effective and efficient manner. This topic will be discussed in greater depth in Chapter III.

Review of Related Research

A review of computerized management systems for individualizing instruction and the research relating thereto indicated that (1) the current state of the art of developing these systems is in its infancy, (2) a total of four prototype systems have been developed and partially documented--System Development Corporation (Instructional Management System Project Staff, System Development Corporation, 1968, and Coulson et al., 1969); New York Institute of Technology (O'Dierno et al., 1968); Learning Research and Development Center, University of Pittsburgh (Cooley & Glaser, 1968); and American Institutes for

Research working with Westinghouse Learning Corporation (Brudner, 1968), (3) in the design of these four prototypes a batch-processing mode of operation had been used extensively, and (4) each prototypic design was based primarily upon statements of their rationale with little or no data upon which to build an empirical model for the intended purpose.

System Development Corporation's computerized management system for individualizing instruction is titled the Instructional Management System (IMS). IMS was developed for public schools using the basic premise that the school needed accurate and timely information about (1) the rate of student progress, (2) learning difficulties encountered, and (3) the resources available to remedy these difficulties if classroom instruction was to be made more individualized and effective. With this underlying concept, IMS was designed to collect data and provide teachers with diagnostic and perscriptive information upon which to base more effective classroom instruction. The initial design of IMS was such that it could be used in conventional public schools with very little initial change in the already existing organizational structures. Subsequently, as a result of many conferences with teachers wherein various reports and other operating difficulties were discussed, changes and modifications were incorporated into the system. However, the basic premise remained unchanged.

New York Institute of Technology labeled their computerized management system for individualizing instruction the Automated Instructional Management System (AIMS). This prototype was developed

around a design philosophy which emphasized flexibility and modularity while providing for the widest range of data processing possible. This system provided analyses and evaluations concerning student progress with a minimum of system restrictions.

The third prototypic computerized management system for individualized instruction was designed at the Learning Research and Development Center, University of Pittsburgh. This system is called IPI/MIS which stands for Individually Prescribed Instruction Management and Information System. This model was designed and implemented to make the operation of the IPI system itself easier and to facilitate the evaluation of IPI as a means of improving education through individualization.

Recently the major strategy for implementing the fourth prototype--Program for Learning in Accordance with Needs (Project PLAN)--was described by Flanagan (1968). This computer managed instructional system, a comprehensive plan, was designed to work closely with school personnel of districts committed to making substantial contributions to the project. Under the leadership of experienced behavioral scientists, evaluation of each aspect of the program scheduled over a period of several years was included from the outset.

Brudner (1968) reported that Project PLAN had been functioning for over a year in representative school districts across the United States with more than 4,000 students enrolled. During the academic year 1967-1968, the system operated in grades one, five, and nine, with grades two, six, and ten added in the academic year 1968-1969. The function of this computer managed instructional system was

to recommend to the teacher a program of study and a matching set of teaching-learning units for each pupil. In order to make such recommendations, the learner characteristics were established with a battery of tests to determine each student's overall achievement status. Thereafter, the computer monitored the data file and operated an informational system to support the teacher who could then spend more time with the students.

The development of these models indicated that there was a growing contingent of educators who believed that computers have a place in education to (1) make the individualization of instruction for large numbers feasible, (2) schedule resources optimally, (3) provide data for empirical revision of instructional materials, and (4) investigate various avenues which could lead to a better understanding of learning processes.

Procedures and Definitions

Phase II of the model development program for elementary school teachers was funded in order that a field study could be conducted which would in turn provide answers to certain feasibility questions and to secure data related to still others. (Phase I and Phase II are described in greater detail in Chapter II.) Since the purpose of this investigation was to study the conceptualized computer management control system of the model, the following questions were addressed:

1. Is a computer required for such a model? If so, must it be a stand-alone system? What would a total acquisition system probably look like? How much of the total computer

processing can be accomplished on the acquisition system which probably will be a small- to medium-sized computer?

2. Should the computer system perform trainee testing? If so, to what extent should this method be employed?
3. What data elements should be collected, and how long should they be retained, for those who
   (a) fail to complete a major phase of the program,
   (b) fail to complete the total program, and
   (c) complete the total program?
4. Who will be the likely users of these data? For what purposes will the data be used? How are reports to be formated so that users can readily make use of the data? Should there be restrictions on the use of the data for research, and who or what group should answer the questions concerning this matter?
5. What kinds of data will be supplied automatically to the trainee, the counselor, and others? How should these data be organized or formated?
6. Should a trainee enter data into the system relating to his own performance on the enablers? If so, can efficient data entry techniques be employed with non-computer oriented trainees?
7. Is it practical to employ "on-line" real-time inquiry mode of operations for counselor-trainee weekly

scheduling sessions? What interface problems are encountered, and what effect will they have on the system operation?

8. What are the major problems encountered during the design, development, and testing of the trial system? How are these problems solved?
9. How should trainee task performance results be entered into the computerized system? By whom should they be entered? What security precautions should be employed both prior to and after entry into the system? Who can authorize and, under what conditions, will changes be permitted?

These questions became the basis for investigating computer managed instruction as a viable element of the model. The investigation, as such, was separated into five stages (see Figure 1).

Stage I was one of planning, computer programing, securing hardware, developing data-collection instruments, and indoctrinating trainees.

During Stage II, data were collected, assistance provided in solving problems, and the collection process was monitored.

Stage III was primarily one of data analysis.

Stage IV represented the combining of empirical data with subjective judgment as the basis for projecting hardware and software systems necessary for the model.

The final stage, Stage V, involved writing the documentation of all project activities.

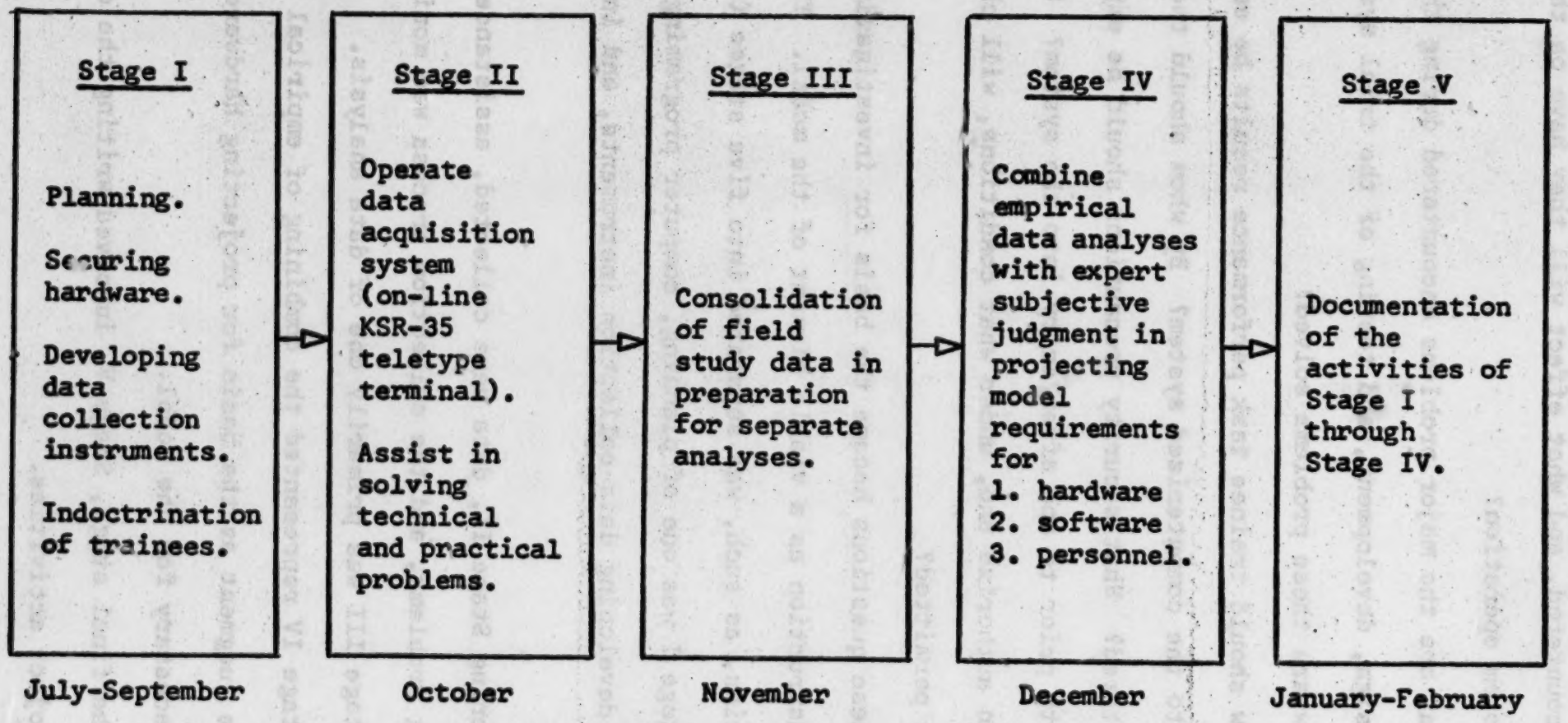

Fig. 1.--Developmental stages of the computer managed instruction module

Computerized management control system is herein defined as the software (computer programs) that will provide for collection, storage, and manipulation of trainee data upon which decisions will be made (by computer or human) concerning individual training programs over a period of many months.

Enabler is herein defined as instruction aimed toward assisting a trainee in attaining the associated objective.

Description of the Conceptual Model

The conceptual model of the elementary teacher training program includes several major objectives. Some of the objectives are (1) to make an early identification of trainees, (2) to include better testing and selection techniques, (3) to provide for early awareness teaching experiences for freshmen and sophomores, (4) to develop a new self-pacing curriculum, (5) to utilize special schools where groups of new teachers would receive continued assistance while embarking on their teaching careers, (6) to encourage specialization and additional professional training during the summers, and (7) to incorporate regular follow-up and feedback data to the model for a built-in revision process.

A more detailed description of the curriculum component and the facilitating component will follow in order that a skeletal framework be provided within which one can see the computer managed instruction subelement in its proper relationship to the entire conceptual model (U. S. Office of Education, Bureau of Research, 1968).

The curriculum component

The curriculum component is subdivided into three phases--an underclass phase, a pre-service phase, and an in-service phase (see Figure 2).

The underclass phase represents the first two years of college with required and elective subjects such as history, humanities, natural science, and social science. In addition, trainees would have pre-professional studies in the behavioral sciences. During this same period, the model would provide for early awareness experiences in order that prospective teachers might gain some insight concerning the role, demands, and rewards of the teaching profession (see Figure 2).

The pre-service phase is designed to begin after trainees have been admitted to the elementary teacher training program. Usually this starting point will be at the beginning of the junior year and continue through the completion of the requirements for a bachelor's degree. The time spent by each trainee in this phase is expected to vary. Emphasis during this pre-service phase will consist of experiences specifically designed to prepare the trainees to fulfill the professional responsibilities of elementary school teachers. Trainees also will study some chosen area of academic concentration such as art, social studies, or mathematics; and, upon successful completion of this phase, each trainee will receive a bachelor's degree and provisional elementary school teacher certification (see Figure 2).

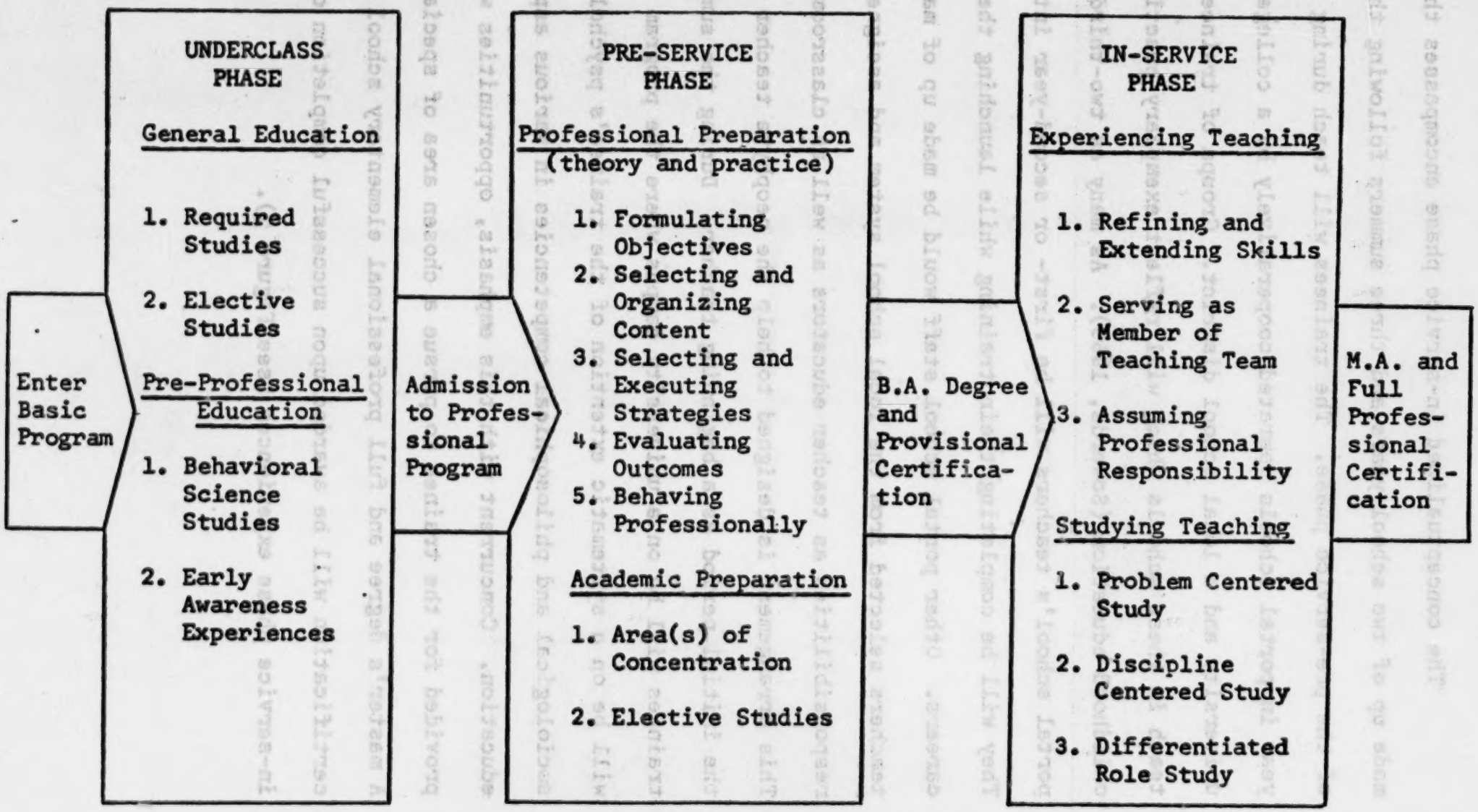

Fig. 2.--A three-phase plan for preparing elementary teachers

Source: U.S. Office of Education, "A Feasibility Study of the Florida State University Model for the Preparation of Elementary School Teachers," p. 4.

The conceptualized in-service phase encompasses the period made up of two school years and three summers following the completion of the pre-service phase. The trainees will teach during the school year in portal schools operated cooperatively by a college or university and a local school district. Groups of trainees will teach in these schools which will reflect exemplary practices in childhood education (Sowards, 1969). As many as two-thirds of the portal school's teachers will be first- or second-year interns. They will be completing their training while launching their teaching careers. Other portal school staff would be made up of master teachers selected from the local school system and assigned special responsibilities as teacher educators as well as classroom teachers. This arrangement is designed to help the neophyte teacher survive the initial period as a beginning teacher. During the summers trainees will be on a university campus where the program emphasis will be on a systematic extention of the trainee's psychological, sociological and philosophical competencies in various aspects of education. Concurrent with this emphasis, opportunities will be provided for the trainee to pursue a chosen area of specialization. A master's degree and full professional elementary school teacher certification will be awarded upon successful completion of the in-service phase experiences (see Figure 2).

The facilitating component

In order that the conceptualized curriculum of the model be implemented and managed with reasonable effectiveness, there is a need for certain facilitating elements. They are an admission and screening process, a computer management system, and adequate staffing. Together these elements, each of which will be described, comprise the facilitating component.

First, procedures for admission and screening of applicants are designed to select for the program those who show evidence of the capability to meet the specified performance criteria and who have demonstrated a commitment to complete the program. Immediately after being admitted to the program, trainees are assessed with regard to a predetermined set of entry skills and knowledge; and, if a trainee has any deficiencies, provisions are made for them to be corrected while beginning the pre-service phase. Screening from the program will be based upon the inability of a trainee to meet specified performance criteria.

Second, the computer management system for the conceptual model is designed to service three major purposes. These are (1) to acquire data on and monitor the progress of trainees, (2) to produce various reports on trainees individually and collectively, and (3) to provide data for research. In order to accomplish these purposes, a dual computer system is considered most appropriate with one system operating in real time and the other system in a batch mode.

The third and final element of the facilitating component is concerned with the staffing requirements for the curriculum component. A variety of new staff roles are expected to emerge as elementary teacher training moves from the traditional type of training program to that conceptualized in the Florida State University model. Three major types of staff roles have been identified for the professional faculty members. They are (1) those working in administration and/or student personnel, (2) those who are teaching and/or counseling, and (3) those who select and develop the curriculum. These professionals will work as a team and thereby be able to take advantage of the unique strengths of each team member. Also, such team efforts will be augmented by university administrative-support services.

While the descriptions of the two major components (curriculum and facilitating) of the conceptual model are brief, they should help one to envision the relative importance of a computer managed instructional system and its relationship to the whole model. In order to further clarify this relationship, a more detailed explication of the curriculum and the data management system will be presented in subsequent chapters.

CHAPTER II

DESCRIPTION OF FIELD STUDY FOR COMPUTERIZED MANAGEMENT CONTROL SYSTEM

Introduction

The Phase I report on the Florida State University Model Elementary Teacher Training Program included a description of an idealized computer management control system. It was anticipated in that report that the management system would be used by trainees, administrators, and researchers; and, in fact, the total system would involve the use of two computers. The first computer would be a medium-size stand-alone system to be used directly in the implementation of the model and would serve as a data acquisition and instructional device. The second computer would serve as a master record-keeper and report generator for trainees, administrators, and researchers. However, the second computer would be used much less by the Elementary Model personnel than by research personnel and other University faculty members. The initial report also discussed such issues as real-time versus off-line uses of the stand-alone system, personnel requirements, and reporting procedures.

Phase II activities were to further explicate the feasibility of functions designated for the whole model through an investigation of procedures which would provide parametric data for projecting

specifications for the model. These parametric data were valuable in developing specifications and in making feasible allocations of functions in the computerized management system.

Field Study

The three-week field study conducted during October 1969 was designed to examine in greater depth a part of (1) the in-service phase of the curriculum, (2) the computer management control system, and (3) staffing roles. This limited field study required the development of curriculum materials using the concepts of tasks, enablers, and options (see Figure 3). Each task was subdivided into enablers. Each enabler had a relationship to the task in that if the trainee could perform satisfactorily on each enabler of a given task, he was theoretically ready to attempt the total task. At the task level, an integration of the sublevel (enabler) competencies was required. Again referring to Figure 3, it can be seen that each enabler had three possible options. For option 1 and option 2, different media presentations related to the objectives of the enabler were available. However, if the trainee did not like option 1 or option 2, he could select materials to his own liking. This selection of materials other than those prepared or selected by the curriculum developers was called a free-choice option.

The model field study curriculum was made up of ten level I tasks. On this level, the overall curriculum for the three weeks was organized to include the behavioral competencies essential to elementary school teachers. Figure 3 shows a sample task which

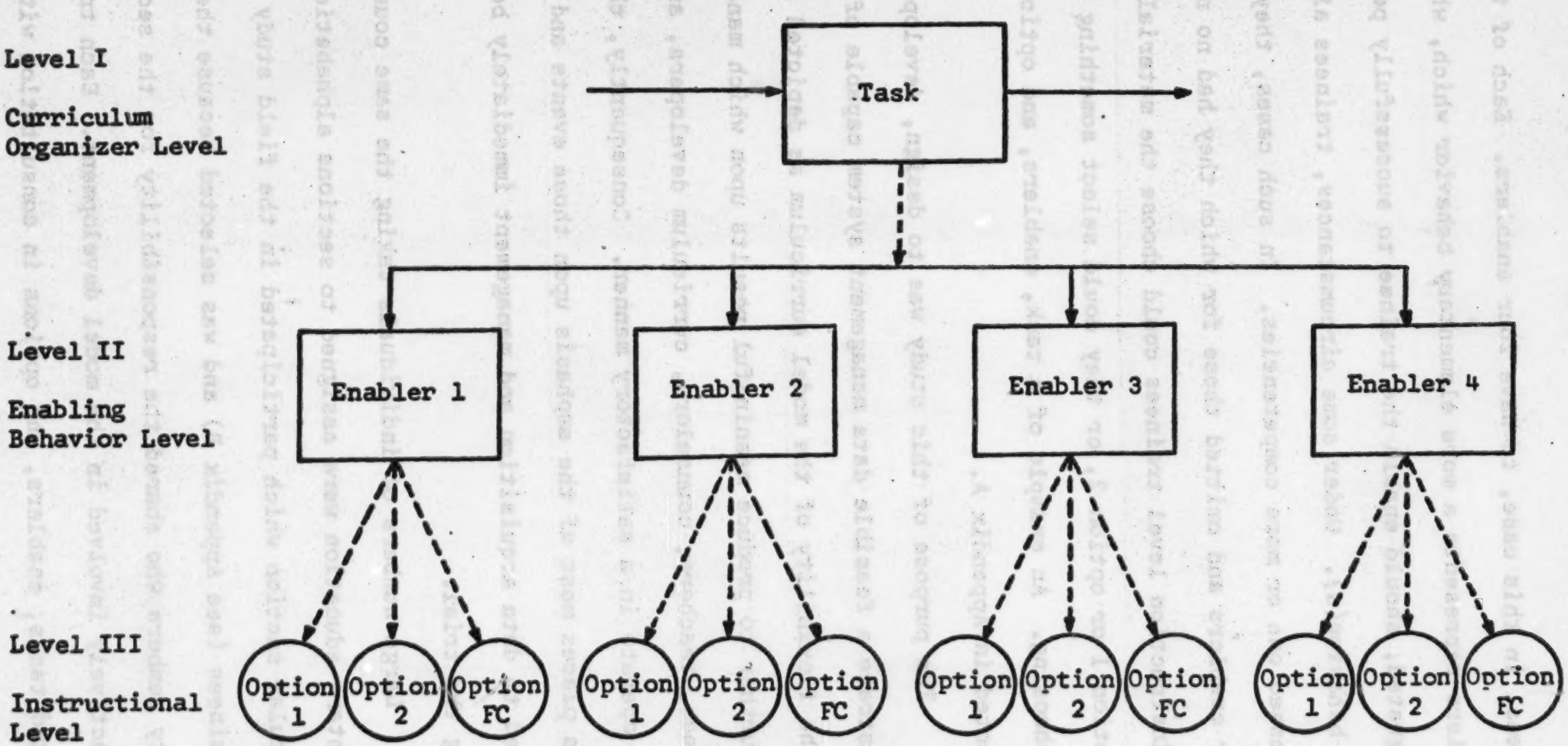

Fig. 3.--Basic instructional model

Source: from U.S. Office of Education, "A Feasibility Study of the Florida State University Model for the Preparation of Elementary School Teachers," p. 14.

happens, in this case, to have four enablers. Each of the four enablers represents a more elementary behavior which, when integrated, should enable the trainee to successfully perform the task behavior(s). Under some circumstances, trainees already possessed one or more competencies. In such cases, they selected other enablers and omitted those for which they had no need. On the instruction level trainees could choose the materials suggested in option 1 or option 2, or they could select something of their own choosing. An example of a task, enablers, and options is presented in Appendix A.

The purpose of this study was to design, develop, and demonstrate a feasible data management system capable of providing for the flexibility of the model curriculum as depicted in Figure 2, and further to produce meaningful results upon which managers, trainees, teachers, counselors, curriculum developers, and researchers could operate in a satisfactory manner. Consequently, this investigation places most of the emphasis upon those events and factors related to data acquisition and management immediately before and during the trial.

Large numbers of individuals taking the same courses in elementary education were assigned to sections alphabetically. The particular section which participated in the field study contained 19 trainees (see Appendix B) and was selected because the two faculty members who shared the responsibility for the section had been actively involved in the model development. Each trainee selected tasks, enablers, and options in consultation with their

counselors. After making their selections, the trainees studied the appropriate enabler materials, took enabler tests, and subsequently had a task evaluation. Most task evaluations required that trainees teach certain facts or concepts to school children from the Leon County schools. The trainees could ask for children of a certain age but were encouraged to try more than one age range. The children who participated ranged from grade one through grade five. Each task evaluation session was recorded on a video tape which trainees were allowed to view privately, with the person who made the task evaluation, another evaluator, or with fellow trainees. Some of the video tapes were retained and are available for examination at the Department of Elementary Education.

It was during this process of selecting tasks, enablers, options, studying the options, and taking enabler quizzes and task evaluations that data were recorded on the task data sheets. This study will deal primarily with the data acquisition process, analyses of the data and their relationship to future specifications, and the implications of data for the whole model and specifically for the computer managed instruction system.

The concept of utilizing two computer systems for the management control activities was retained during the feasibility study which was conducted between October 6 and October 24, 1969. It should be pointed out that the prototype field study did not

attempt to test the entire conceptual model described in Phase I--only selected elements--with the computerized management control system being one of the elements selected.

The field study activities were focused on two primary areas of significance for the total project. The first set of activities tested the feasibility of the day-in-day-out utilization of the computer for data acquisition for management of the elementary model program as well as for instructional purposes. The second area dealt with the feasibility of developing master computer programs which would (1) accept formated data from the data acquisition computer system, (2) create a permanent data file, and (3) sort these data in order to provide meaningful reports on the long range functioning of the training program. These functions were conceptualized as falling into two categories. The first category was associated with the long-term analysis of trainee performance and the effectiveness of the instructional materials while the second dealt with the utilization of these data in order to provide cost benefit analysis information.

The overriding consideration in all of these activities was to generate data and feedback from trainees' data which would permit projections of maximum validity for a computer system which would be capable of serving the needs of approximately 1,000 trainees. The primary concern was to combine the information from the 19 trainees in the field study with the extensive experience of the project personnel in the area of computer assisted instruction in order to

derive the optimal functions of a computerized management and instructional control system which would provide direct trainee-computer interaction.

It must be acknowledged that most of the computer functions which were tested in the field study and which are projected for the eventual operational system, to this date, have only been investigated in research and developmental environments. This feasibility study provided additional insights into the technological and human problems and potentialities of such a system. Only through continued investigation of computer management functions, both in isolation and as an integrated system, will the total potentialities and benefits be identified and developed.

Overview of Field Study Activities

The following sections present activities pursued in the day-to-day operations, in curriculum and student evaluation, and in providing data for research, control system, and cost benefit analyses. These activities were carried out by project personnel who interacted directly with the curriculum and instruction group, designer and developer of the three-week field study, and with the project management personnel. The primary consideration of the computer system group was to institute activities which would provide information on the feasibility of various systems components and at the same time provide minimal interference with the ongoing field study. In order to achieve the objectives of the field study, the equipment and capabilities of two additional organizations were

brought to bear on the situation--the Florida State University CAI Center and INTERTEC Corporation. A KSR-35 teletype terminal was rented from the Southern Bell Telephone and Telegraph Company and installed in the resource room in order that computer-trainee interaction could be investigated as an intergal part of the three-week field study. This terminal was linked to the computer equipment in the CAI Center and programs were written by local staff for the operation of this equipment. Certain other computer programing work was subcontracted to the INTERTEC Corporation. The subcontract resulted in the production of programs (for the Control Data Corporation 6400 computer) which would provide information for the long range planning and cost benefit analysis procedures. Integration of these activities into the total feasibility study are described in sections which follow.

Feasibility of the Stand-Alone System

Major objectives

The first phase of the management system feasibility study dealt with a series of activities which were designed to provide parametric information in order to derive specifications for the operational computer system. The four primary objectives for the investigations in this area and the types of information which were obtained are listed below:

1. To determine the feasibility of implementing an on-line CAI-based data acquisition system in the three-week

field study. It was deemed mandatory that the existing equipment in the CAI Center be utilized in order to gain insight into the problems associated with utilizing a computer terminal for data acquisition purposes within a program for individualized instruction. Information secured here was primarily in terms of training the trainees to use the equipment, developing CAI programs for data acquisition and testing, and determining the effectiveness of the trainee-terminal interface.

2. To obtain empirical data on the ability of the trainees to enter data via a terminal into the computer information system on their own learning progress. The data here included information on the percentage of participation by the trainees, numbers of errors made, and general attitudes toward the use of the terminal.

3. To obtain time estimates of trainee usage of the terminal. These time estimates were based upon two types of trainee activities, namely, recording of their progress in the training program and taking enabler tests which were provided by the QUIZ computer program.

4. To acquire data from the trainees which could be utilized in the second and third components of the study, namely, the programs associated with long range planning and cost benefit analysis.

Equipment

The computer system utilized in this study was the CAI Center's IBM 1500 system. This system had been modified by the addition of a PDP/8 computer to accommodate remote terminals, that is, terminals located beyond the confines of the CAI Center. For this particular study, the terminal (a KSR-35) was located in the Education Building, a distance of approximately one-fourth of a mile from the CAI Center. The terminal was connected to the PDP/8 computer by a conventional telephone line. Since the terminal ultimately tapped into the IBM 1500 system, it was thus possible to design a dialogue between the trainee and the computer which was written in Coursewriter II--a tutorially oriented instructional language which is utilized on the IBM 1500 system.

Materials and procedures

During Stage I of this investigation, which preceded the actual field study, the primary source of data collection was developed, reviewed with project personnel, and suggested revisions incorporated (see Appendix C). This data collection instrument, called the task data sheet, was a single sheet upon which trainees wrote information such as name, social security number, task number, scheduled start date, scheduled complete date, enablers selected, and data associated with each enabler. Each data sheet provided a complete record of the trainee's performance on a single task from the curriculum developed for the field study.

The data sheet for each task was initiated in a conference between the trainee and his counselor. All information on each

enabler such as options selected, time spent studying the enabler, and subsequent performance on the enabler quiz, as well as the final task evaluation, was entered on the data sheet. Options in the field study were coded to indicate both the option selected and the media employed by that particular option (see Appendix D). In part, this was necessary because the means and methods for collecting these data were developed after the rationale for tasks, enablers, and options had been decided and the instructional materials were in the preparation and/or development process.

When a trainee gave an acceptable performance on a task and had been informed of the results, the task data sheet was presented to the evaluator for entry of these data. By such a procedure, the trainee was assured that his enabler performance scores would not, in and of themselves, influence the evaluator's scoring of the criterion test on the task. These procedures were explained to the trainees in order that they could understand that the purpose of enabler tests was for feedback concerning the degree to which the trainee was prepared to perform acceptably a given part of the total task.

A CAI program, called DATA, using Coursewriter II was written specifically to ask the trainees about the information which they had written on their task data sheets (see Appendix E). This procedure was in sharp contrast to the typical CAI program which most often provides information to a trainee and then tests him on his understanding of that information. This program was primarily a dialogue which asked the trainees to respond to a variety of questions by typing in information which they had recorded on their task data sheets.

DATA was designed to assist in (1) examining how trainees react to entering their own data, (2) determining if non-computer oriented trainees could enter such information with an acceptably low error rate, and (3) determining the time required to complete these activities. In order to discriminate among the responses of various trainees on various tasks, the trainee was required by the DATA program to enter his social security number and the number of the task for which he wished to enter data. Upon analysis of this task number (by the DATA program), the trainee was automatically transferred to the corresponding segment of the total program which would, in turn, code each of the trainee's responses to questions with appropriate identifier labels. These identifier labels then made it possible to systematically analyze the data.

A trainee was permitted to enter as much data as he desired during any session at the terminal. Questions were asked at appropriate points in the program to allow the trainee to continue entering data on the same task or to enter data on another task. When the trainee was ready to terminate the entry of data items, he was administered a series of ten questions. A short form of the A-State scale from the State-Trait Anxiety Inventory was the source of the first five items presented to the trainees (Spielberger, Gorsuch & Lushene, 1969). The state anxiety items which were chosen were designed to measure the anxiety of a person which is attributable to a particular situation in which he finds himself. The exact nature of this five-item scale is indicated in the results section, as are the trainees' responses to the questions. The second set of items

related to the trainees' attitudes toward learning and their satisfaction in interacting with technological devices. There were in fact ten of these latter items, but only five of them were administered with the odd numbered tasks and the other five were administered with the even numbered tasks. These items were selected from the Attitudes Toward Learning (ATL) survey developed by the Learning Service at Michigan State University (Davis, Marzocco, & Denny, 1967). Both scales were chosen because of their relevance to the problem which was being assessed and because of their previous utilization and validation in other experimental studies.

A second CAI program also using Coursewriter II, called QUIZ, provided an additional type of information to the project. The QUIZ program consisted of a series of objective tests which accompanied a similar number of enablers in the field study curriculum materials. From those tests designed by the curriculum group for the various task enablers, those which were most amenable to computer implementation were coded into the IBM 1500 system.

The trainee (at the terminal) signed onto the program QUIZ and was asked to identify the task and enabler on which he wanted to be tested. The program would then branch to the appropriate quiz and present it to him one item at a time with corrective feedback. At the conclusion of the test, the trainee was automatically presented his total score for the test and an indication that (1) he should either proceed because he had performed satisfactorily, or (2) he should consider reviewing the option or utilizing another option in

order to enhance his skills in this particular area. This quiz score was recorded by the trainee on his task data sheet for subsequent entry into the data acquisition system through the DATA program.

In addition to the installation of the terminal device and the design of the data acquisition forms, the investigator participated in the orientation of the trainees to the terminal system. During the week prior to the initiation of the field study, the investigator met with trainees in groups of ten and explained the total rationale for the system and how it would operate. Each trainee was given a chance to sit individually at the terminal and become familiar with its operation. It also became necessary during the first few days of the actual field trial for the resource room coordinator to spend some time with a certain number of the trainees in their initial attempt to enter data into the computer system. Other trainees were provided additional instruction and review of the operation of the teletype terminal as required. However, assistance after the first week was minimal.

When a trainee received an acceptable task performance evaluation, the evaluator entered the information on the task data sheet. The task data sheets were reproduced weekly in order to provide a copy for use in the verification of the accuracy of data which trainees had entered into the DATA program. Normally all enabler data were entered into the computer prior to a task performance evaluation. Upon receipt of the completed task data sheets (including task evaluation information), the investigator entered the final task

evaluation performance and associated dates. Task data sheets and the two programs--DATA and QUIZ--formed the data collection system for the field study which subsequently provided data for the computerized management control system as well as for the prototype model in general.

In summary, the field study as it related to a computer management control system was concentrated in the design, development, and demonstration of data acquisition procedures and techniques which accommodated the flexibility of the model curriculum and still provided useful and meaningful data to the various users. The results of the data acquisition system are reported in Chapter III.

CHAPTER III

ANALYSES OF THE FIELD STUDY

Introduction

The field study data were relevant to at least four major facets of the conceptual model. They were (1) the feasibility of implementing a computer managed instruction system, (2) the unknown human factors, such as those related to the use of an on-line data acquisition system, (3) the equipment usage factors (time parameters) which would permit hardware and software projections, and (4) the formating of data for transfer from the acquisition computer system to the research computer. Consequently, this chapter will analyze the field study data under these four major headings.

Feasibility of Implementation

It was found that in terms of actually presenting questions to trainees and deriving information from them, the CAI Course-writer II language was ideally suited for this application. There were no problems whatsoever in designing the courses for this purpose. Some difficulty was experienced in terms of obtaining the teletype terminal and having it installed. However, this had been expected because of the high demand for this type of equipment. Once installed and checked, it operated satisfactorily throughout the duration of the field study.

The DATA and QUIZ programs were scheduled to be up every day from 8:30 in the morning until 2:00 in the afternoon, and the terminal was made available to trainees on a first-come-first-serve basis. Communication was easily maintained between the resource room and the CAI Center via telephone when minor difficulties arose. The terminal also was activated on certain evenings during the field study. Problems arose several times concerning such things as trainees wanting access to the programs when they were not available. However, in each case the situation was remedied, and trainees were able to use the terminal.

Human Factors

The trainees' responses to the request that they enter their enabler data via the teletype terminal was satisfactory with one exception. Approximately 90 percent of the trainees entered their data up through Task 6. However, the participation lessened in the latter part of the third week. It should be pointed out, however, that trainees were requested to enter these data from their task data sheets, but no pressure was brought to bear if they did not.

The analysis of individual responses (actual data entered by trainees) indicated that the accuracy of these data was 98.9 percent correct (there were 14 errors on 1,320 data items entered). The DATA program was specially designed to detect obvious errors in data entered by trainees and to make a diagnostic response, whereupon the trainee could enter data to replace that which had been detected as incorrect. For example, a scheduled start date

which was indicated as the 39th of the month was checked by the program, rejected, and the trainee so informed. He was asked to enter the correct data. However, as the data indicated, there were only 14 inaccuracies in all data items which were entered, excluding the detectable obvious errors described earlier. This accuracy percentage was based upon a comparison of the actual computer records which were generated when trainees entered answers to questions from the DATA program and the actual entries on their task data sheets.

Trainee responses to anxiety and attitude toward learning items are summarized in Table 1 and Table 2, respectively. The means and dispersions indicated that trainees were not anxious in terms of their interaction with the computer. Under the heading "Responses" in Table 1 and Table 2, the numbers indicate how many times the trainees chose that particular response to the associated question. For example in Table 1, Item 4 (I am jittery) indicates that 47 trainees responded "Not at all"; and none of the trainees chose the response "Very much so." The chi-square test indicated that the observed frequency distribution of responses for each of the five items was significant. Refer to Table 1 for the levels of significance. Also, an inspection of the raw response data during the preparation of Table 1 and Table 2 revealed that there were no discernable fluctuations of responses during the three-week field study.

Further examination of the data in Table 2 indicates that as a group (1) they would probably recommend this type of experience to their friends, (2) they preferred to plan their own study schedule rather than have someone else plan it for them, (3) they tended toward

TABLE 1

TRAINEE RESPONSES TO STATE ANXIETY SCALE ITEMS

Item	Responses				Mean	χ^2
	Not at all	Somewhat	Moderately so	Very much so		
1. I am tense.	36	26	10	3	1.73	33.42**
2. I feel at ease.	6	23	16	30	2.93	15.18**
3. I am relaxed.	11	17	16	31	2.89	10.51*
4. I am jittery.	47	23	5	0	1.44	68.97**
5. I feel calm.	8	15	21	31	3.00	13.68**

*$p < .01$.

**$p < .001$.

Source: from U.S. Office of Education, "A Feasibility Study of the Florida State University Model for the Preparation of Elementary School Teachers," p. 60.

TABLE 2

TRAINEE RESPONSES TO COMFORT ITEMS

Item	Responses					Mean	χ^2
	Very probable	Probable	Undecided	Probably not	Most probably not		
1. I would recommend this type of learning experience to my friends.	33	6	4	1	0	1.39	72.59***
2. I prefer to plan my own study schedule rather than have someone else lay it all out for me.	27	13	3	1	0	1.50	54.24***
3. I enjoy working with mechanical gadgets of all kinds.	13	7	10	12	2	2.61	7.13**
4. It is a teacher's responsibility to see to it that I learn the subject matter of a course.	0	5	1	16	22	4.25	38.56***

TABLE 2--Continued

Item	Responses					Mean	χ^2
	Very probable	Probable	Undecided	Probably not	Most probably not		
5. I like to figure out how to do a thing by myself rather than be told.	5	27	6	5	1	3.32	44.74***
6. I learn best by working closely and directly with the teacher.	5	12	4	5	4	2.70	5.88*
7. Whenever I have to operate a machine, I become nervous.	0	4	1	12	13	4.13	20.88***
8. I prefer to study a particular course at a regularly scheduled time rather than vary the time to fit my needs and inclinations.	1	2	1	13	13	4.17	22.88***

TABLE 2--Continued

Item	Responses					Mean	χ^2
	Very probable	Probable	Undecided	Probably not	Most probably not		
9. When I'm learning a new subject, I like to skip around and let my interests lead the way rather than proceed through it on a step by step basis.	2	9	2	10	7	3.37	7.20**
10. The ideal learning situation involves one student and one teacher.	5	4	9	5	7	3.17	1.54

*p <.05.

**p <.01.

***p <.001.

Source: from U.S. Office of Education, "A Feasibility Study of the Florida State University Model for the Preparation of Elementary School Teachers," p. 62.

being undecided about enjoying working with mechanical gadgets, (4) they did not feel the teacher was responsible for seeing that they learned the subject matter, and (5) they tended to enjoy working things out for themselves rather than being told. Only on one item were they most clearly divided and uncertain. This was the question dealing with whether the ideal learning situation involves one student and one teacher. The responses ranged from very probable to most probably not. This was the only anxiety or attitude question for which the distribution of responses did not significantly differ from what could be expected by chance (see Table 2).

It should be noted that certain trainees entered more data at the terminal than other trainees; and, therefore, they were asked these questions more often than other trainees (see Table 3). However, the fact that there were few extreme reactions to the questions would seem to show that the trainees did not find the interaction with the terminal or the entry of data a threatening or unpleasant experience.

Another human factor item is depicted in the data presented in Table 4 where the number of trainees that signed on to enter data for each day of the field study is shown. While no pressure was brought to bear upon the trainees or schedules established for their use of the KSR-35 teletype terminal, the trainees spread their usage of the terminal rather well for the first two and one-half weeks of the three-week trial. The terminal was retained in operation for the fourth week to accommodate a few stragglers.

TABLE 3

TERMINAL TIME PER STUDENT PER ENABLER

Student number	Average time (minutes) required "on terminal" to enter data for each enabler
t001	2.6
t002	2.5
t003	.9
t004	1.6
t005	2.1
t006	2.0[a]
t007	1.4[a]
t008	1.3[a]
t009	1.7[a]
t010	1.5
t011	2.1[a]
t012	1.9[a]
t013	1.8
t014	1.4
t015	1.5
t016	1.8
t017	1.8
t018	2.5
t019	1.7
Mean time per student	1.8
Range of times	.9 to 2.6
Standard deviation	.43

[a]These six trainees entered 55 percent of all the data elements entered into the data acquisition program (DATA).

Source: from U.S. Office of Education, "A Feasibility Study of the Florida State University Model for the Preparation of Elementary School Teachers," p. 63.

TABLE 4

TRAINEE SIGN-ONS FOR THE DATA PROGRAM

Period	Day of the Week				
	Monday	Tuesday	Wednesday	Thursday	Friday
First week	4	10	4	7	4
Second week	7	5	5	2	3
Third week	9	3	3	0	2
Fourth week[a]	0	1	2	0	4

[a]This week was not a part of the three-week field study.

Another human factor item stems from the data presented in Figure 4. This figure indicates the proportion of errors on enabler tests (computer and manual) across the ten tasks. An error rate approaching 20 percent is indicated, which means that for each 15-item enabler test there was an average of three incorrectly answered items. The implications of these data will be developed later in this chapter.

Also, it is perhaps worth noting some of the more predominant, informal comments made by the trainees about the utilization of the terminal (see Chapter IV). One comment related to the frequency of and the need for anxiety and attitude questions in the DATA program. It was explained that this was purely an aspect of the research activity and that in an operational setting such questions would not be asked, or certainly not with the frequency with which they were presented in the field study.

Another area of concern to a small number of trainees was the lack of true dialogue between the trainee and the computer. These trainees had had some experience with CAI presentations in which the computer played a much more human-like role. In the DATA and QUIZ programs, there was a very straight-forward questioning procedure with very little "humanization" of the dialogue process. The trainees felt that their participation, particularly in the testing, could have been enhanced through a more dialogue-like interrogation of their understanding of the particular enabler. They also expressed some dislike in using the terminal as a device simply for printing out a

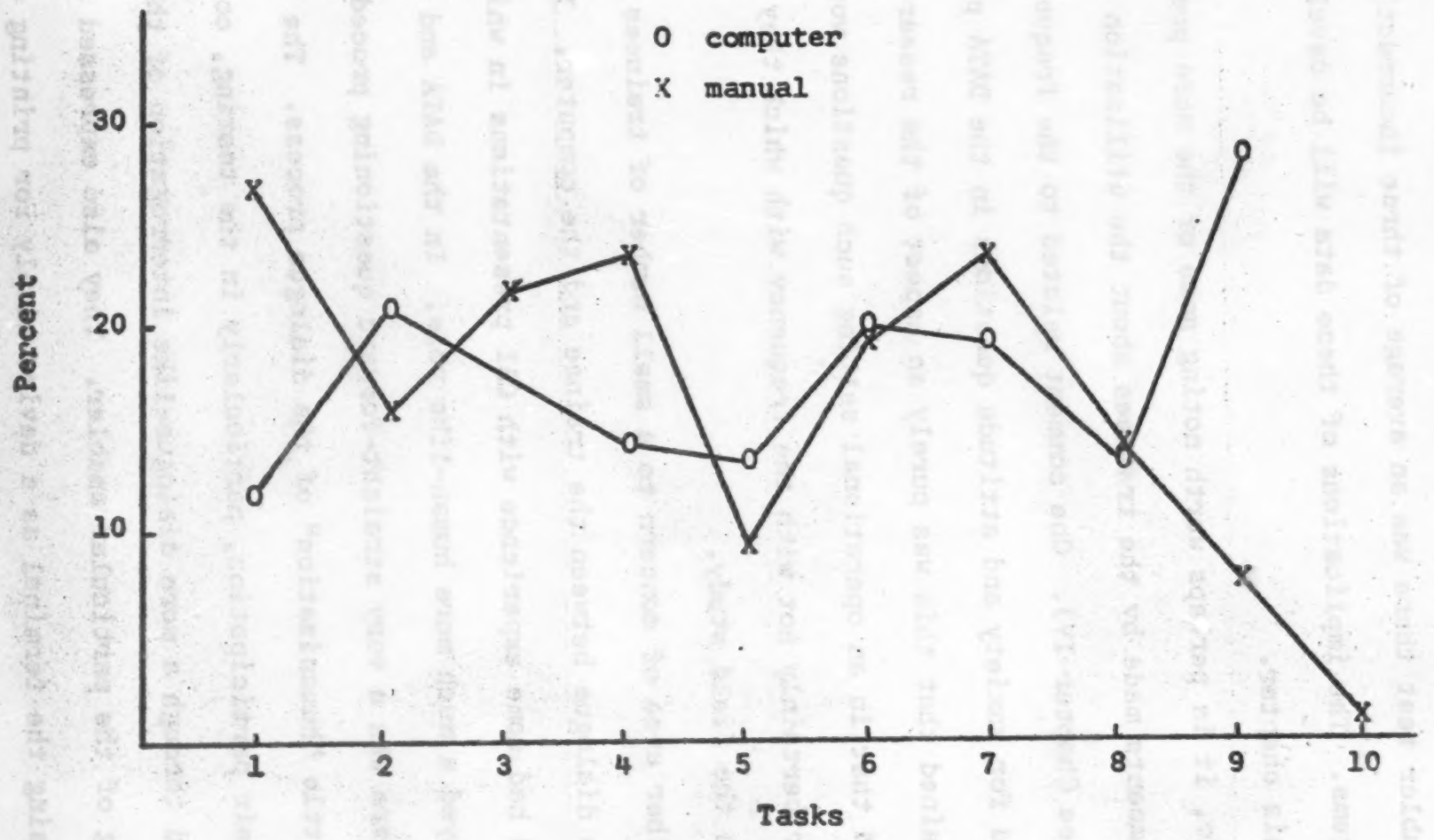

Fig. 4.--Proportion of errors on enabler tests

Note: Task 3 and task 10 had no computer administered enabler tests. Also, task 10 represents only one enabler test score.

test, recording their responses, and providing feedback. This may be an important human factor consideration in terms of future developments.

Time Parameters

An analysis of the records from the DATA program provided the information on trainee terminal time shown in Table 3. An average of 1.7 minutes per enabler of "on terminal" time was required if we assume that the 6 trainees who entered over one-half of the data are representative. However, this "on terminal" average is increased to 1.8 minutes per enabler when all of the data for the 19 trainees are included. Therefore, for simplicity, certain projections regarding hardware configurations were based upon 1.75 minutes per enabler of "on terminal" time. The trainee's time required to enter data for each enabler ranged from a low of .9 minute to a high of 2.6 minutes with a standard deviation of .43.

The data in Table 3 were obtained from a detailed listing of the trainees' responses to the DATA program. In the program itself, a clock was set to determine the amount of time spent by the trainee from the initiation of the questioning about an enabler until he had completed the information for that enabler. If he entered information on a number of enablers at the same sitting, separate clock readings were obtained for each enabler for which data had been entered.

An additional type of time parameter was obtained through the terminal record which is provided in a master file for each trainee who utilizes the IBM 1500 CAI system. This record was the primary source by which the computer determined where the trainee

reentered a learning program when he signed off. A portion of this record also contained the trainee's total clock time, i.e., the total accumulated time between every sign-on and sign-off, that a trainee had spent on a course. These times, for both the QUIZ and DATA programs, are listed in Table 5 along with the means and standard deviations for the groups. It is interesting that on the average, the trainees spent approximately an hour in total elasped time in each of these two activities. However, there was a great deal of variability among trainees as indicated by the range of times--7 minutes to 143 minutes.

These on-terminal-time data were utilized to make projections about the number of terminals which would be required for the on-line entry of learning performance by trainees in Chapter V.

Further analyses from the field study indicated that the trainees attempted 2.87 enablers per task and that they completed 2.22 tasks per week; therefore, they used an average of 6.4 enablers per week or 19.2 enablers for the field study. This total number of enablers--19.2--divided into the total time spent at the terminal on the DATA program--63.68 minutes (according to the terminal records)--indicated that approximately 3.3 minutes per enabler were required to enter the data into the system. This 3.3 minutes per enabler is in contrast to the 1.75 minutes per enabler as derived by the very precise programing methods described above.

Discrepancy in these two methods may be attributed to the fact that the total time on the system included the sign-on time, time to enter their social security number and task identification,

TABLE 5

TOTAL STUDENT CLOCK TIME (IN MINUTES) FOR DATA AND QUIZ PROGRAMS

Student number	Quiz times	Data entry time	Total time
t001	87	76	163
t002	31	36	67
t003	66	94	160
t004	no computer tests	31	31
t005	30	49	79
t006	36	74	110
t007	125	70	195
t008	61	62	123
t009	41	55	96
t010	7	36	43
t011	143	125	268
t012	129	78	207
t013	no computer tests	24	24
t014	10	65	75
t015	41	203	244
t016	7	16	23
t017	56	23	79
t018	133	43	176
t019	135	50	185
Total	1,138	1,210	2,348
Mean time per student	59.86	63.68	123.54
Range of times	7 to 143	16 to 125	23 to 268
Standard deviation	47.25	42.06	73.41

Source: from U.S. Office of Education, "A Feasibility Study of the Florida State University Model for the Preparation of Elementary School Teachers," p. 65.

as well as the responses to the anxiety and learning attitude items. For projection purposes, an average of the two estimates or 2.52 minutes per enabler was used to estimate the amount of time per enabler which would be spent at the terminal for data acquisition purposes.

Using these parameters the average trainee would require 16.128 minutes per week in order to enter the required data. For 1,000 students there would be a requirement for 16,128 minutes of terminal time per week. Assuming that a terminal would be available 9 hours a day, 5 days a week, there would be 2,700 minutes of terminal time available per week on each terminal. Dividing this figure into the total number of minutes required results in an estimate of almost 6 terminals for this function. However, it must be assumed that due to down time and incomplete usage of the terminals, there would be an approximate 75 percent utilization rate. Therefore, there would be a need for 8 terminals to service 1,000 trainees for data entry purposes alone.

Almost identical estimates were derived for the number of terminals required in order to provide trainees with time to take quizzes at the terminal. The average time required per student in the field study for taking quizzes was 59.86 minutes. Therefore, approximately 16 terminals would be required for both data acquisition and quiz type usage of the computer system.

Data Formating

The field study was designed to test both of the computer systems described in the conceptual elementary model. This researcher was primarily concerned with the acquisition and computer managed instruction system. However, there was a need to provide data from the acquisition system to the subcontractor responsible for developing and testing the research and costing programs. Due to the time constraints of the field study and to economic considerations, it was not considered worth the necessary expense to build formating software for the two trial systems. Therefore, data were keypunched for testing of the research and costing programs.

Also, data and information were collected during the field study upon which some broad estimates can be made concerning the volume of data which will have to be managed, formated, and transferred. For example, 1,000 trainees completing 6.4 enablers per week would generate 6,400 data records per week. Each of these data records would contain approximately 30 characters per data record, or about 192,000 characters of information per week would be generated. In addition, there would be a need to store, maintain, and update scheduling data for these same 1,000 trainees. The scheduling function would add approximately 150 characters per trainee per week or 150,000 more characters of data. While these volumes of data are strictly estimates, they are based upon certain empirical data and information from the field study. These estimated volumes highlight

the need for a data acquisition and processing system which will reduce the clerical effort and again point out the impossibility of handling all of these data manually.

Summary

The analyses of the field study data indicated that (1) trainees can operate satisfactorily in an on-line data acquisition system, (2) it is feasible to have a computer managed instruction system for the elementary model, (3) there will be a large quantity of data associated with the training of 1,000 teacher trainees, (4) a significant number of interactions will be required in order to provide relevant feedback for the anticipated number of trainees' incorrect answers, and (5) one hour per week of trainee-terminal interaction would not dehumanize the model program and yet would allow sufficient time for each of the activities which will be described under software (see Chapter IV).

CHAPTER IV

PROPOSED COMPUTERIZED MANAGEMENT INSTRUCTIONAL SYSTEM (SOFTWARE)

Introduction

This chapter will present the proposed computer management instructional system for the elementary model. The overall framework is presented first, followed by a description of the research oriented programs and associated sample reports. The chapter is concluded by a look at future developments which are considered appropriate for the Florida State University elementary teacher training model.

General

Every response entered by a trainee during the field study was automatically recorded by the IBM 1500 system on magnetic tape. At the end of each day, these data records from a great variety of courses and individuals are sorted into the separate courses (or programs) and then sorted by individual trainees within those courses. A series of tapes from a number of days are then merged to form a trainee history file. The operational management system, as proposed, would operate on this trainee file in order to format data for the CDC 6400 programs.

Florida State University and subcontractor personnel collaborated on the development of a master input record for the trainee file for the CDC 6400 computer. The task record layout

appears in Table 6. This formated record for the CDC 6400 contains complete information on a single task for a given trainee; i.e., a record would only be written by the data acquisition system when a trainee had (1) completed a task and (2) received an acceptable evaluation on it. When the record preparation program encountered an acceptable task evaluation response, it would collect all of the trainee's information on the enablers for that task, arrange these data in a predetermined order and fixed format, leaving those enablers which were unattempted blank, and accumulate information only in terms of the attempts trainees had made in receiving an acceptable evaluation on a task performance. Only the completed task records would then be written to a new tape which would be submitted to the CDC 6400 programs in order to update the master file for later use with the research and cost analysis programs.

Because the volume of data for the three-week field study was manageable for keypunching purposes, task data information was transcribed to an existing task form and provided to the subcontractor in order to obtain real data more rapidly for a trial of the research and costing programs. However, the sort and merge techniques currently available on the IBM 1500 system would provide a model for future preparation of trainee records, thereby eliminating the keypunching employed in the field study. These records would be sorted daily and merged once a week into a file which, in turn, would be interrogated by a record preparation program to produce fixed format records for updating the master file on the CDC 6400

TABLE 6

TASK RECORD LAYOUT

Item Description	Position Location
Social Security Number	01 - 09
Code	10
Task Number	11 - 13
Time Entered	14 - 17
Time Completed	18 - 21
Task Performance	22 - 27
Number 1	(22 - 23)
Number 2	(24 - 25)
Number 3	(26 - 27)
Enabler Number 1	28 - 81
Option number 1	(31 - 47)
option code	((31 - 33))
standard time	((34 - 37))
actual time	((38 - 41))
standard performance	((42 - 43))
actual performance	((44 - 47))
number 1	(((44 - 45)))
number 2	(((46 - 47)))

TABLE 6--Continued

Item Description	Position Location
Option number 2[a]	(48 - 64)
Option number 3[a]	(65 - 81)
Enabler Number 2[b]	82 - 135
Enabler Number 3[b]	136 - 189
Enabler Number 4[b]	190 - 243
Enabler Number 5[b]	244 - 297
Enabler Number 6[b]	298 - 351
Enabler Number 7[b]	352 - 405
Enabler Number 8[b]	406 - 459
Enabler Number 9[b]	460 - 513
Enabler Number 10[b]	514 - 567

[a]Same option subdivisions as in Enabler Number 1, Option number 1.

[b]Same enabler subdivisions as in Enabler Number 1.

Source: from U.S. Office of Education, "A Feasibility Study of the Florida State University Model for the Preparation of Elementary School Teachers," p. 68.

computer. Data not ready for such formating would be retained and merged with data accumulated during the following week.

These formated records would be read into the CDC 6400 computer where they would be placed in the master file. Each trainee's file would grow as he progressed through the curriculum. These master file records would then be available for usage with the research and cost analysis programs.

Long Range Research and Planning

As indicated earlier the feasibility study (Phase I) recommended that two computer systems be utilized within the total management configuration. This recommendation was adhered to during the field study. The CAI Center's IBM 1500--the first system--served primarily for data acquisition, testing, and formating. The CDC 6400--the second system--served as the basis for program development for long-range research in planning and cost analysis. The latter programs require relatively large data storage devices, rapid retrieval capability, and high speed printers. The program development for the second system was subcontracted to INTERTEC Corporation. While the CDC 6400 served as the basis for the developmental effort subcontracted to INTERTEC Corporation, the programs were written in COBOL at their home office in Huntsville, Alabama. Later, the programs will be implemented on the CDC 6400 computer currently on the Florida State University campus.

The purpose of the long-range research and planning programing capability was to devise programs which would serve a variety of users

within the total elementary model program. Four such users have been identified: counselors, researchers, program managers, and curriculum designers.

With the primary users of the long-range system in mind, the staff and subcontractor personnel agreed upon the formating and output requirements for such a system. The general input format for trainee data was described in Table 6. It was the staff's intent that one data sheet would contain all information on a single task for a given trainee, i.e., one sheet would be capable of providing all the information which would be needed to supply data to a variety of programs including the long-range research scheduled for the CDC 6400 system (see Appendix C).

After agreeing on the input format, discussions were then held with regard to the substance of the output from this series of research programs. Concern was shown not only for attempting to anticipate the needs of various users within the system, but also to format the output information in a manner which would be most usable by the recipients. However, even with these precautions, it was recognized that the formating of the output reports should at this time be considered tentative because only through actual experience can programs be modified to maximize the usefulness of the reports which they generate.

Sample Output Formats

The purpose of this section is to present sample outputs from the complex of programs which comprise the long-range research

and planning package. These sample reports will be discussed in connection with the counselor programs, researcher programs, management programs, and curriculum designer programs.

Counselor programs

Since counselors and trainees alike will have a master booklet describing the various tasks, enablers, and options which exist within the program, the information contained in Table 7 will be useful to the counselor as he reviews the progress of a trainee. Table 7 presents a trainee's sequential performance on various tasks and the enablers and options which he chose as he progressed through the program. The trainee's progress can be assessed not only by his task evaluation performances but in terms of the time required to complete a particular task, the number of times he attempted it, and, in general, the overall elapsed time required by him to proceed through some set number of tasks.

It was anticipated that Table 7 would be utilized in conjunction with a knowledge of the trainee's background and interests for individualized counseling sessions in order to provide better guidance on the selection of future tasks within the total program. Such reports would be provided periodically and would not replicate the preceding one, but would contain only new information.

Table 8 would also be available to the counselor for assisting the trainee in his selection of enabler options. This report would indicate, for the individual trainee, his average time and performance and selection preferences for the various types of media sources within the array of options available to him. These data should give

TABLE 7

FLORIDA STATE UNIVERSITY
ELEMENTARY MODEL PROJECT

STUDENT PERFORMANCE REPORT

STUDENT NUMBER
261021618

STUDENT NAME
STEPHENS MARCIA LYNN

TASK	SUB-TASK	OPTION	ACTUAL PERFORMANCE	AVERAGE PERFORMANCE	STANDARD DEVIATION	COMPLETION TIME	NUMBER ATTEMPTS
002	002	101	99	99.00	0.0	.2	1
002	002	201	00	00.00	0.0	.1	1
002	002	***	50	00.00	0.0	.3	1
002	003	101	75	75.00	0.0	.4	1
002	003	***	75	00.00	0.0	.4	1
002	004	104	90	85.00	5.0	.3	1
002	004	***	90	00.00	0.0	.3	1
002	010	3PT	99	99.00	0.0	.5	1
002	010	***	99	00.00	0.0	.5	1
002	***	***	99	99.00	0.0	1.5	1
003	003	221	00	67.83	23.6	.5	1
003	003	***	00	00.00	0.0	.5	1
003	004	107	77	65.45	24.7	.5	1
003	004	209	45	40.66	31.5	.2	1
003	004	***	61	00.00	0.0	.7	1

TABLE 7--Continued

TASK	SUB-TASK	OPTION	ACTUAL PERFORMANCE	AVERAGE PERFORMANCE	STANDARD DEVIATION	COMPLETION TIME	NUMBER ATTEMPTS
003	010	2PT	99	99.00	0.0	.5	1
003	010	3PT	00	73.68	42.5	.5	1
003	010	***	50	00.00	0.0	1.0	1
003	***	***	99	99.00	0.0	2.2	2
005	002	122	45	25.00	36.7	.5	1
005	002	226	01	19.22	27.2	.5	1
005	002	***	23	00.00	0.0	1.0	1
005	003	201	45	79.28	27.8	.1	1
005	003	***	45	00.00	0.0	.1	1
005	010	3PT	99	99.00	0.0	.8	1
005	010	***	99	00.00	0.0	.8	1
005	***	***	99	99.00	0.0	1.9	1
006	003	104	83	62.33	29.5	.2	1
006	003	***	83	00.00	0.0	.2	1
006	004	101	70	63.66	25.4	.6	1
006	004	204	45	55.40	33.2	.	1
006	004	***	58	00.00	0.0	.6	1
006	006	211	45	41.75	27.4	.2	1
006	006	310	45	22.50	22.5	.2	1
006	006	***	45	00.00	0.0	.4	1

TABLE 7--Continued

TASK	SUB-TASK	OPTION	ACTUAL PERFORMANCE	AVERAGE PERFORMANCE	STANDARD DEVIATION	COMPLETION TIME	NUMBER ATTEMPTS
006	010	3PT	99	99.00	0.0	.8	1
006	010	***	99	00.00	0.0	.8	1
006	***	***	99	99.00	0.0	2.0	1
007	003	207	45	46.40	19.3	.3	1
007	003	***	45	00.00	0.0	.3	1
007	010	3PT	99	99.00	0.0	.6	1
007	010	***	99	00.00	0.0	.6	1
007	***	***	99	99.00	0.0	.9	1
008	010	3PT	99	99.00	0.0	.8	1
008	010	***	99	00.00	0.0	.8	1
008	***	***	99	99.00	0.0	.8	1

STUDENT SUMMARY

TOTAL COMPLETED			PROGRAM	AVERAGE TIME	TASKS ATTEMPTED		
TASKS	SUB-TASKS	OPTIONS	TOTAL TIME	TASK	ONCE	TWICE	THREE TIMES
6	17	23	18.6	3.1	05	01	00

Source: from U.S. Office of Education, "A Feasibility Study of the Florida State University Model for the Preparation of Elementary School Teachers," p. 158.

TABLE 8

FLORIDA STATE UNIVERSITY
ELEMENTARY MODEL PROJECT

STUDENT TASK PERFORMANCE REPORT

STUDENT NO/NAME	TASK NO	TIME ENTR	TIME COMP	PERFORMANCE 1	2	3	SUB NO	OPTION 1 OPT CD	STD TIME	ACT TIME	STD PERF	ACT PERF	OPTION 2 OPT CD	STD TIME	ACT TIME	STD PERF	ACT PERF	OPTION 3 OPT CD	STD TIME	ACT TIME	STD PERF	ACT PERF
261021618 STEPHENS MARCIA LYNN	002	1006	1007	99			002	101	0001	0002	99	99	201	0007	0001	99	00					
							003	101	0007	0004	99	75										
							004	104	0007	0003	99	90										
							010											3PT	0005	0005	99	99
	003	1007	1008	00	99		003						221	0015	0005	77	00					
							004	107	0005	0005	99	77	209	0005	0002	99	45					
							010						2PT	0005	0005	99	99	3PT	0005	0005	99	00
	005	1013	1016	99			002	122	0007	0005	77	45	226	0005	0005	77	01					
							003						201	0003	0001	99	45					
							010											3PT	0008	0008	99	99
	006	1017	1021	99			003	104	0002	0002	99	83										
							004	101	0007	0006	99	70	204	0002		99	45					
							006						211	0007	0002	77	45	310	0005	0002	77	45
							010											3PT	0008	0008	99	99
261028291 OSBORNE BETSY	001	1006	1007	99			004	104	0002	0005	99	99										
							005	101	0005	0002	99	90										
							010											3PT	0005	0005	99	99

Source: from U.S. Office of Education, "A Feasibility Study of the Florida State University Model for the Preparation of Elementary School Teachers," p. 159.

the counselor some insight into the types of materials which seem to work best with each particular trainee. Also, it may serve the purpose of assisting in the diagnosis of individual learning difficulties which the trainee may be exhibiting.

Researcher programs

It is often difficult to identify the precise data needs of a researcher and consequently to define who this person might be; but in this particular case at least, a researcher may be defined as someone other than a counselor, program manager, or curriculum designer. This researcher's interests could be quite varied and might be encompassed within the range of programs described here, or he might need an entirely different set of programs using the same master record file data base. For example, Table 7 and Table 8, previously described, might be of interest to him. However, it is more likely that Table 9 would be more representative of a useful report for him. It represents an accumulation of data through the use of a generalized information retrieval program in which the researcher can specify the variable, and the values of that variable, upon which he would like to select information. For example, in the sample report shown, the researcher identified "Junior College Transfers" as the basis for selection. The report also showed that he would like to select only trainees who had completed the basic studies program. Therefore, summarized performance on the various tasks, average time for each task, and the number of trainees who had completed the basic studies program and are junior college trainees were included. This program could also be utilized to show trainee performance on enablers

TABLE 9

FLORIDA STATE UNIVERSITY
ELEMENTARY MODEL PROJECT

REPORT OF PARTICULAR CHARACTERISTICS
JUNIOR COLLEGE TRANSFERS

TASK	SUB-TASK	OPTION	AVERAGE PERFORMANCE	STANDARD DEVIATION	AVERAGE TIME	NUMBER OF STUDENTS	PERCENT REPEATING
003			99.00	0.0	0.5	12	8
	002		00.00	0.0	0.0		
		101	15.33	20.9	0.9	3	
		201	59.00	28.4	0.4	6	
	003		00.00	0.0	0.0		
		101	43.25	29.3	0.6	4	
		221	65.00	22.6	0.8	11	
		301	77.00	0.0	0.1	1	
	004		00.00	0.0	0.0		
		104	62.88	26.6	0.4	9	
		209	40.66	31.5	0.3	3	
		306	00.00	0.0	0.7	1	
	010		00.00	0.0	0.0		
		2PT	99.00	0.0	0.5	3	
		3PT	73.50	42.5	0.5	12	

Source: from U.S. Office of Education, "A Feasibility Study of the Florida State University Model for the Preparation of Elementary School Teachers," p. 161.

and options. The basic advantage of this program, as shown in Table 9, is that it can utilize background information on trainees as well as their current performance in order to select relevant data. This capability should be of great advantage to the researcher.

The programs which produce such reports as shown in Table 10 should also be of value to the researcher. This table shows a summary of trainee performance over tasks on a variety of media. This information could lead to further hypotheses which would be investigated through the particular selection techniques demonstrated in Table 9.

Management programs

A program manager's interest will, for the most part, center on analyses which facilitate fiscal management, allocation of human and material resources, and program effectiveness as evidenced by time and quality dimensions of trainee performance when compared with instructional alternatives available. For these purposes, Table 9 using a general selection technique or Table 11 can be of value. Table 11 is of interest because it shows, both by name and by frequency count, the last task completed by each trainee in the program. A quick listing of this type would indicate to the manager exactly where trainees are in the program. This provides an excellent method by which a whole series of time projections could be made in terms of the demands for both human and physical resources within the program. Eventually, as information accumulates, it is expected that programed projections of estimated resource needs and trainee task completions can be made.

TABLE 10

FLORIDA STATE UNIVERSITY
ELEMENTARY MODEL PROJECT

SUMMARY OF RESOURCE USAGE

RESOURCE CODE	AVERAGE TIME	AVERAGE PERFORMANCE	STANDARD DEVIATION	PERCENT OF TIMES CHOSEN	DESCRIPTION
00	1.2	0.00	0.0	0.22	MISCELLANEOUS
01	0.6	67.93	2.8	33.48	RESOURCE CENTER WRITTEN MATERIALS
02	0.5	41.80	3.7	1.11	FSU LIBRARY MATERIALS
03	0.5	59.60	3.2	3.34	16 MM FILMS
04	0.4	67.98	2.8	11.38	PREPARED VTR
05	0.3	64.50	2.8	1.33	INSTRUCTIONAL SEMINAR
06	0.4	33.16	4.6	1.33	CONSULTATION -INDIVIDUAL OR SMALL GROUP-
07	0.5	60.54	2.7	7.81	AUDIO TAPE
09	0.3	40.66	3.1	0.66	PRACTICE WITH PUPILS
10	0.3	64.33	1.4	0.66	STUDENT TEXTBOOKS
11	0.5	35.33	2.7	1.33	SOCIAL STUDIES MATERIALS
12	0.0	96.00	0.0	0.22	PROFICIENCY TEST
14	0.1	45.00	0.0	0.22	TEACHING AIDS
21	0.8	64.07	2.8	3.12	FILM STRIPS AND AUDIO TAPE
22	0.5	25.00	3.6	2.00	FILM STRIP, AUDIO TAPE, RESOURCE CENTER MATERIALS
26	0.6	21.50	2.8	1.78	VIDEO TAPE AND RESOURCE CENTER MATERIAL

Source: from U.S. Office of Education, "A Feasibility Study of the Florida State University Model for the Preparation of Elementary School Teachers," p. 162.

TABLE 11

FLORIDA STATE UNIVERSITY
ELEMENTARY MODEL PROJECT

LAST TASK COMPLETED

TASK NO.	SOCIAL SECURITY NO.	STUDENT NAME	FREQUENCY
006	261028291	OSBORNE BETSY	16
007	265022608	RANDLE CAROLYN	17
007	261842533	PRATER MARY	17
008	267849675	OLSON JOANNE	15
008	266888223	THIBAULT JAMES	15
008	262887750	STOCK DIANE MARY	15
008	261021618	STEPHENS MARCIA LYNN	15
009	267760300	SEARCY JUDITH	12
009	266947581	SPANO PATRICIA	12
009	264840422	PLUMMER BARBARA	12
009	263909639	SUESS CAROLYN E	12
009	263822436	SMALL SUSAN	12
009	263028644	THROWER KATHY MARGARET	12
009	262987822	RESER KATHLEEN	12
009	262846508	SHUMAN SUSANNE	12
009	261821181	STEPHENSON MARY BERNRUTER	12
010	308503475	SHELTON ALICE	3
010	262969335	REED SUSAN	3
010	262968618	SAYERS MARIA	3

Source: from U.S. Office of Education, "A Feasibility Study of the Florida State University Model for the Preparation of Elementary School Teachers," p. 163.

Curriculum designer programs

The curriculum designer will have a continuing interest in obtaining data as a form of feedback in terms of the effectiveness of materials used by the trainees. Table 12 should be considered a device for an initial screening of the various instructional materials in order to assess their effectiveness. This report indicates, by task, the options which were chosen and with what frequency under each of the enablers. In addition, study time and average performance are indicated. Table 13 presents resource usage data in decending order by the percentage of times a particular medium was chosen. These data are far from the complete information which would be utilized for curriculum revision purposes, but it would provide an initial source for determining problem areas which need immediate attention.

More complete data would be obtained in the resource center through various evaluation techniques built into materials by the designer. Many of the materials obviously will utilize trainee response techniques, i.e., materials which require responses from a trainee. These data would be summarized and made available to the designer. Additionally, the curriculum designer may also find Table 9, from the generalized information retrieval program, of great value in terms of assessing the effectiveness of various materials with various users.

These sample reports should provide a basis or framework from which revisions can be made which will more adequately meet specific needs (as they become better defined).

TABLE 12

FLORIDA STATE UNIVERSITY
ELEMENTARY MODEL PROJECT

TASK NUMBER 003

TASK PERFORMANCE REPORT

		NUMBER OF STUDENTS	PERCENT ELECTED	AVERAGE TIME	AVERAGE PERFORMANCE	STANDARD DEVIATION	NUMBER PASSING ON FIRST TRY
OPTION	101	4	21.0	001.1	30.75	032.2	4
OPTION	201	9	47.3	000.4	65.00	024.7	9
SUB-TASK	002						
OPTION	101	7	36.8	001.0	63.71	032.6	7
OPTION	221	12	63.1	000.8	67.83	023.6	12
OPTION	301	1	05.2	000.1	77.00	000.0	1
SUB-TASK	003						
OPTION	107	11	57.8	000.4	65.45	024.7	11
OPTION	209	3	15.7	000.3	40.66	031.5	3
OPTION	306	1	05.2	000.7	00.00	000.0	1
SUB-TASK	004						
OPTION	2PT	4	21.0	000.5	99.00	000.0	4
OPTION	3PT	16	84.2	000.5	73.68	042.5	16
SUB-TASK	010						
TASK	003	16	84.2	002.6	90.00	000.0	12

Source: from U.S. Office of Education, "A Feasibility Study of the Florida State University Model for the Preparation of Elementary School Teachers," p. 164.

TABLE 13

FLORIDA STATE UNIVERSITY

ELEMENTARY MODEL PROJECT

PERFORMANCE RELATED TO RESOURCE USED

STUDENT NUMBER

261021618

STUDENT NAME

STEPHENS MARCIA LYNN

RESOURCE CODE	AVERAGE TIME	AVERAGE PERFORMANCE	STANDARD DEVIATION	PERCENT OF TIMES CHOSEN
01	0.2	57.80	33.6	21.73
04	0.1	72.66	19.7	13.04
07	0.4	61.00	16.0	8.69
09	0.2	45.00	0.0	4.34
10	0.2	45.00	0.0	4.34
11	0.2	45.00	0.0	4.34
21	0.5	0.00	0.0	4.34
22	0.5	45.00	0.0	4.34
26	0.5	1.00	0.0	4.34
PT	0.6	84.85	34.6	30.43

Source: from U.S. Office of Education, "A Feasibility Study of the Florida State University Model for Preparation of Elementary School Teachers," p. 160.

Future Developments

One of the most important benefits of this feasibility study was the opportunity to reevaluate the total range of functions which should be available on the computerized management control system. The analysis of these functions and their allocation to one of the two computer systems utilized the data estimates from the field study, research experience gained during the past four months through the administration of an on-line computer-managed instruction course, and the expertise in computer technology of professional and technical personnel of the CAI Center.

Instructional management

Based on the analyses of the data collected during the elementary model field study and the CMI course, a number of generalizations seem relevant.

First, in the original proposal and in the field study itself, a dual computer system concept was considered best for a number of reasons which included (1) security of data base, (2) better capability to produce timely and appropriate reports, and (3) the fact that most of the small stand-alone system time would be required for data acquisition. However, not only did the field study conclusively demonstrate that reliable data could be collected from trainees themselves, but that if data acquisition, enabler quizzes, and CAI are brought together into an expanded scope for CMI, a far more powerful use can be made of the small stand-alone system. For example, when a trainee took an enabler quiz on the computer terminal, such

items as his enabler performance and date of completion could be used to update automatically that particular trainee's data file. Such automatic data file additions would be equally appropriate when materials were presented via CAI.

Not all relevant data would normally be directly acquired through trainee interaction with the computer because certain enabler and task evaluations could not, and indeed should not, be limited to computerized testing techniques. It is, therefore, being proposed that small optical scanning devices be used to collect the results of these off-line evaluations. This enlarged concept of CMI decreases the amount of computer time dedicated solely to data acquisition functions and allows updated files to be held and available for on-line interrogation by managers and counselors. This conceptualized filing and records maintenance system facilitates the generation of the types of reports envisioned as necessary and appropriate for the model's general operation.

The data acquisition and enabler testing will not require the total time available to the stand-alone system. Therefore, it will be possible to use the system for some instruction (CAI), scheduling, and certain reporting functions. For instance, two small files could be retained within the stand-alone system: (1) a trainee file with student number, last task completed, number of tasks completed, total scores on all task evaluations, and total time in the program; and (2) a task file with the number of trainees completing the task, the total of scores on all task evaluations, and a total of all times spent

on tasks. Since completed task information will be formated for the master file on the large-scale computer, it would be a relatively simple matter to update these restricted trainee and task files for the stand-alone system.

These files on the stand-alone system could be used to produce weekly reports on the current status of each trainee on each task. Rather than print data week after week, changes which occurred since the last week's reports could be used to produce an addendum to the previous reports.

Because of these general findings, much less emphasis was placed upon the large research computer-analysis and report-producing functions. However, as indicated in a later section, the larger research computer concept was not completely discarded.

Second, with 1,000 trainees (as projected for the model) and a realistically limited number of counselors, the interaction with a computer may serve a more useful psychological purpose than originally expected. An interactive, on-line computer system that asks questions and responds with another question or comment was deemed better than no interaction at all. Consequently, trainees who complained of the lack of interactive experiences with meaningful feedback may be provided this additional element of interaction through the use of computer terminals and the employment of CAI-type dialogue in this man-machine contact.

This generalization seems to be indicated from the reactions of trainees (see Table 2) during the three-week trial to such attitude preference statements as: I prefer to plan my own schedule (the

trainees agreed); it is the teacher's responsibility to see to it that I learn the subject matter of the course (they disagreed); and I would recommend this type of learning experience to my friends (they agreed). In essence, responses received during the trial to attitude statements (considered in greater detail in Chapter III) led to the general conclusion that interaction with a terminal may well serve as an important secondary interactive element within the model program.

Third, the fact that counselors will need data which they can readily understand in order for counseling to be most effective was reinforced by the field study. The recognition of still another related fact--that of a faculty-counselor:trainee ratio which will probably preclude all students from having daily or sometimes even weekly individual sessions--may suggest that human counseling by exception will become the modus operandi. At any rate, counseling sessions could be automatically scheduled for those students who are experiencing certain types of difficulties. The exception counseling would require a more explicit definition by which identification of trainees could be made. In the enlarged scope for CMI for this model, progress-performance ratios could be computed from which exceptions would be detected. Consequently, group seminars composed of trainees experiencing similar difficulties could be scheduled in addition to individual conferences.

Fourth, the field study indicated that scheduling should be given most serious and perhaps primary consideration in future developments. Keeping track of 1,000 students is a big problem; which ones want what, when, and where may well be the most crucial

element of the whole model. Herein, it was conceptualized that a simplistic matrix system would be most practical, manageable, and probably serve the model best. Under such a system, a trainee would be responsible for entering his proposed schedule for approximately a week and, if openings permitted, confirmation of the proposed schedule would be received by him immediately. When, because of limitations of resources, a particular time slot is filled or otherwise unavailable, a vector could be presented (if requested) indicating the time or times during the week that were available for a particular activity. Such schedules could be printed and posted for reference.

Essentially this system would operate on a first-come-first-serve basis. Scheduling in this manner is almost essential in order to know what the students expect to do and to insure that resources will be available for them. Individual student scheduling in a real-time environment with immediate knowledge of availability is not only manageable but appears to be very desirable.

Proposed system and its functions

On the basis of the analysis of both the field study data and the continuing developments in computer technology, it is proposed that the computerized management system for the elementary model be capable of carrying out six specific functions. These functions are (1) computer managed instruction or CMI; (2) computer assisted instruction or CAI; (3) counseling and scheduling; (4) weekly reporting; (5) data formating; and (6) long-range planning, research, and cost analysis. The first five functions would be carried by the

stand-alone system dedicated to the model program. The sixth function would be serviced by a large computer system.

Computer managed instruction.--Although computer managed instruction has many definitions, the one primary characteristic which does seem to be agreed upon is that no instruction takes place in terms of an interaction between an individual and a computer. The type of CMI system which was proposed as a result of the field study included this function and a dialogue-like testing situation for all enablers that are appropriate for computer testing. The purpose of testing at the enabler level was both diagnostic and, to a certain extent, prescriptive in order to prepare the trainee for the task evaluation session. An additional function of the CMI system will be to automatically generate data records for the trainee and to insert these data into the record file of the week's activities. It was clear that not all data would be acquired via direct trainee-terminal interaction; therefore, there would be two optical scanning devices which would interface directly into the computer system. Data collected in non-computerized evaluation sessions would be recorded on optical scan sheets and read by the scanners, generating additional trainee data records.

Computer assisted instruction.--The second function of the system would be that which is considered as conventional CAI. However, a careful analysis of the instructional objectives for any task should be conducted before committing any learning activity to the relatively limited amount of time which will be available for CAI. It might be

anticipated that certain drill and practice or perhaps problem-solving activities could best utilize the CAI system capability.

Scheduling and counseling.--This system function would provide the trainee with a dialogue-like interaction with the computer which would, on the basis of a limited student history file, provide the trainee with information on his own progress through the training program and assist him in making decisions about those activities which he should pursue. It would be during this interaction that the trainee would schedule future activities. A description of the proposed scheduling techniques was provided earlier in this section.

Weekly records.--The CMI, CAI, and scheduling and counseling functions are all directly related to trainee-computer interaction. The fourth function, weekly records, provides information to counselors and program managers in a timely fashion. It is proposed that at the end of each week, as the trainee data records are sorted, merged, and prepared for standardized formating, that several data tables be updated, summarized, and made available to the counselors and managers. These data tables would be based primarily on trainee progress during the week and the future resource needs as indicated by the scheduling demand. Since these file structures would be primarily based on cumulative updated information, they could be printed out on a weekly basis or the files could be made directly available to the counselors and managers through interaction at a terminal.

Record formating.--Although it was proposed that the stand-alone system take on more of the functions which had originally been

delegated to the larger computer, it will still be necessary to format and block records which would be written on tape and made available for further analysis on a larger system. This formating activity is scheduled for the stand-alone system.

Long-range planning, research, and cost analysis.--It is anticipated that programs developed by the subcontractor in the feasibility study, as well as other statistical programs, will provide researchers, curriculum developers, and cost/benefit analysts with the necessary tools to operate effectively. Since most of these users would require access to the entire data base, there would be a continuing requirement to format and store the data records emerging from the ongoing operational system for their use.

Summary

A general overview of the computer managed instruction system for the model indicated which programs will require a large-scale data storage and retrieval capability and which programs can be processed on a smaller stand-alone system. Various sample reports were presented and described generally in terms of their expected usefulness to the potential user groups. Last, future developments which are considered important to the model and technically feasible were presented and summarized in identifiable subunits. These field study data were interpreted in terms of what the software for the elementary model computer management instructional system should contain.

CHAPTER V

PROPOSED COMPUTER (HARDWARE) CONFIGURATION AND OPERATIONAL STAFF

After completing analyses of the field study data, the investigator met with technical and management personnel of the CAI Center to discuss the hardware and personnel requirements for an operation such as that proposed in Chapter IV. Taken into account during this discussion was the time per terminal required for trainees to perform the various activities (using data developed and presented in Chapter III), the proposed reassignment of functions between the stand-alone computer system and the large-scale computer, and the impact of these factors upon the stand-alone computer hardware specifications.

It was determined that the large-scale computer system mentioned in the Phase I report will still be required to carry out the sixth function described in Chapter IV. However, the amount of time for report generation had been drastically reduced by shifting four of the five computer functions described in Chapter IV from the large-scale system to the stand-alone system fully dedicated to the elementary model. Additionally, based on past history, advances in technology in the computer industry will probably eliminate the need for this computer system in the next two years. In the meantime,

the characteristics of the large-scale system require that it include at least: 64K core, four or more tape drives, a large disk or drum, and a high speed printer. It was considered that nearly any major university research computer would meet these specifications.

For some time the computer project staff had been investigating and analyzing new low-cost computer equipments which had been appearing on the market. Analyses of the capabilities of these new equipments clearly indicate that it would be possible to program one of these computers to carry out the functions which were described for the elementary model stand-alone system. However, no computer manufacturer, either large or small, has software (computer programs) to provide for the functions which have been described and assigned to the stand-alone computer system. Yet, based upon the experience of the systems programers in the CAI Center, who were present during the discussions mentioned above, it is their opinion that several of these smaller computers could have adequate operating systems designed for them to accomplish the functions allocated to the stand-alone system. Table 14 contains a list of computer equipment which was determined by the computer staff to be adequate for the stand-alone system which has been described.

The previously discussed analyses indicated that 16 terminals were required for data acquisition and testing of 1,000 trainees. After considering the following factors: (1) most systems of the type under consideration are capable of operating 32 terminals, and (2) terminals in excess of those required for data acquisition and testing would allow for CAI, on-line scheduling, and additional

TABLE 14

COMPUTER EQUIPMENT

Number	Description	Estimated Cost
1	CPU with 8K word memory	$ 30,000
1	8K word additional memory	15,000
1	Program protect and instruction trap	1,500
1	Variable base register	400
1	Stall alarm	400
1	Auto start	400
1	Interrupts (10 levels)	1,000
1	Index register	500
1	$60H_z$ real time clock	400
1	High speed paper tape read/punch	7,500
1	Movable head disk	26,000
2	Digital I/O	6,000
8	External synchronization attachments	2,000
16	ASCII MODEM interface	17,600
32	KSR-33	35,200
1	Cabinet	1,600
1	Power supply	500
2	Optical scanner	20,000
1	Line printer (300 lpm)	24,000
1	Magnetic tape control (9 track, 800 bpi)	11,000
2	Magnetic tape unit (48 kc)	38,000
2	Nine track option	4,800
1	Card reader (400 cpm)	11,500
Total Estimated Cost		$255,300

Source: from U.S. Office of Education, "A Feasibility Study of the Florida State University Model for the Preparation of Elementary School Teachers," p. 93.

system flexibility, it was decided that the proposed stand-alone system should be equipped with 32 terminals (see Table 14). The total acquisition cost for this stand-alone computer system is estimated to be $255,300.

If this cost is amortized over a period of five years, the cost for the equipment would be approximately $51,000 per annum. Assuming that the terminal devices were operated for 9 hours per day, 40 weeks in a year, a total of 57,600 terminal hours will be available. And further assuming that there might be approximately 25 percent of non-usage time per terminal, the total available terminal hours would be reduced to about 43,000 with an estimated cost of $1.20 per terminal hour.

Therefore, the trainee could have 16 minutes (as projected) for data acquisition, 16 minutes for enabler quizzes on the computer, and about one-half hour for CAI materials, scheduling, or counseling, all at the cost of approximately $1.20 per week per trainee. This $1.20 per week can be divided into two parts--the trainee interactive part and the report production part. With the computer staffed for a 16-hour-per-day operation, there would be 9 hours for trainee interaction and 7 hours for report production. Such a division would allocate 68 cents and 42 cents per trainee per week respectively to the interactive part and the report production part. At the end of five years the computer hardware would be purchased. These cost represent only the hardware portion of the management system.

The next item discussed with the CAI Center's technical and management staff was related to personnel requirements. The

substance of these discussions and conclusions are contained in Table 15 and Table 16. Table 15 represents what is considered to be the bare minimum for a system operating without curriculum materials preparation, research, and software systems modifications and/or development. In contrast to the operations-oriented personnel projections, Table 16 indicates the personnel complement that would be very desirable to combine and blend the myriad of activities which naturally converge upon a computer operation. Some of these activities are clarified in the brief descriptions of the personnel which follow.

Operators perform the prescribed routine functions which allow a relatively inexperienced person to operate sophisticated equipment and software packages without having to understand the what, when, why, and how behind his actions.

An operator-programer is primarily an operator, but on occasion may be required to perform simple programing tasks. He would be using predeveloped, tested, and documented software.

The operations supervisor has operator-programers and/or operators reporting to him. He is responsible for scheduling work, maintenance, and general supervisory functions of the computer area and personnel.

Coders, usually excellent typists, enter curriculum materials, edit them, copy programing functions, and generally give a great assist to the actual curriculum authors.

TABLE 15

PROJECTED PERSONNEL AND SALARY REQUIREMENTS FOR MANAGEMENT SYSTEM
(OPERATIONS ORIENTED)

Number	Description	Monthly Rate	Monthly Total	Annual Total
2-1/2	Operator-programer	$ 500	$1,250	$15,000
1	Operations supervisor	600	600	7,200
4	Proctors	300	1,200	14,400
1	Center manager	1,300	1,300	15,600
Estimated Personnel Cost			$4,350	$52,200

TABLE 16

PROJECTED PERSONNEL AND SALARY REQUIREMENTS FOR MANAGEMENT SYSTEM
(OPERATIONS AND RESEARCH ORIENTED)

Number	Description	Monthly Rate	Monthly Total	Annual Total
3	Operators	$ 500	$1,500	$18,000
1	Operations supervisor	600	600	7,200
2	Coders	400	800	9,600
4	Proctors	300	1,200	14,400
1	Systems programer	1,200	1,200	14,400
1	Systems manager	1,500	1,500	18,000
Estimated Personnel Cost			$6,800	$81,600

Source: from U.S. Office of Education, "A Feasibility Study of the Florida State University Model for the Preparation of Elementary School Teachers," p. 94.

The proctor's primary activity is to assist the trainees in the utilization of the equipment, answering questions, and generally maintaining an orderly flow of trainees to and from the terminals.

A systems programer designs, develops, and even at times codes program packages which will interface with other operating systems. Such a person should have a good knowledge of hardware, logic, programing languages, and the ability to work under pressure in developmental efforts.

A center manager has the supervisory, fiscal, and problem-solving functions in the center. He is the overall coordinating and planning officer for the entire operation.

The systems manager must carry all of the responsibilities of a center manager but be able to direct the efforts of more people, specifically the systems programing staff. For without direction from the systems manager, software systems development may not be compatible with the overall center objectives.

An examination of Table 15 and Table 16 will show the expected monthly and annual expenditures that will be required for staff to operate the stand-alone management system. The operations-oriented staff structure would cost an estimated $4,350 per month or $52,000 per annum, while the operations-and-research-oriented staff cost would be approximately $6,800 per month or $81,600 per annum.

In summary, the estimated purchase price for the hardware requirements for the stand-alone computer system, the personnel

requirements for an operations-oriented system, and the personnel requirements for an operations-and-research-oriented system have been presented in this chapter. However, it should be pointed out that none of these data include one-time costs such as initial training, installation of wiring, raised flooring, and air conditioning.

CHAPTER VI

DISCUSSION OF FIELD STUDY PROBLEMS

While problems or difficulties are presented in this chapter along with attendant solutions, it should be emphasized that the field study proceeded much more smoothly than might have been hoped for. In large measure this was due to good planning, hard work, cooperation, and interest of the personnel directly involved. Therefore, any enumeration of problems encountered should be viewed more as a measure designed to present a relatively complete documentation of the field study than as a criticism. Here again, primary emphasis has been placed upon matters which had or will have some relation to the model's computerized management control system.

Securing a terminal for the field study presented some difficulty. A KSR-33 teletype terminal was most desirable since this same type of equipment was already operating with the CAI Center's IBM 1500 from remote locations. When contacted, Southeastern Telephone Company could not guarantee delivery until well after the scheduled field study was to have been completed, so contact with Southern Bell Telephone and Telegraph Company was made. A KSR-33 terminal was not available, but a KSR-35 terminal could be installed by the date required. It was decided that this terminal could be made to operate

satisfactorily whereupon two orders were placed, one with Southeastern Telephone Company for a line between the CAI Center and the Resource Room in the Education Building and the second with Southern Bell Telephone and Telegraph Company for a KSR-35 terminal.

Coordinating these two orders was no small task, but prior to the beginning of the field study both the line and terminal had been checked out. Subsequently, another difficulty came to light. The KSR-35 terminal did not have an "ALT CODE" key which was used on the KSR-33 terminals to get the computer's attention and without which a trainee could not sign onto a program. By making a modification to the operating system employed on the CAI Center IBM 1500, a second type of signal generated by the KSR-35 terminal was recognized in order to get the computer's attention for this particular terminal.

While conceptualizing and investigating the best techniques for data collection using the programing language, Coursewriter II, another difficulty arose. There were two primary considerations--the non-computer oriented trainee's ability to enter data and the eventual analysis of the data. It was desirable to have an easy small step data entry system for the trainees. Yet when examination of the data was considered, a long formated string of numbers was preferable. From these two considerations, the original design of DATA was developed. This program received, examined, accepted, or rejected trainee data in small steps considered reasonable for them to enter. Further, as these small quantities of data were accepted, they were placed into a counter to which subsequent data were added. When the single string record was completed, the entire contents of the

counter were moved to a buffer for recording in the same manner as all other small steps had been recorded except that a special identifier label was attached. This met both the trainee and data analysis considerations. However, because the program (internal to the computer) checked to see how many actual characters had been entered at the terminal before making a recording, the contents which had been meticulously built in a counter and transferred to the buffer were not recorded into the trainee's record file because the internal program sensed that no data had been entered at the terminal. This problem required a reconceptualization of the DATA program in which the prime consideration was for the trainee and not for data analysis. Such a program was then developed with little difficulty. It should be pointed out that in an operational setting there could be modification made to this program which checked to determine the number of data characters entered at a terminal to allow one to build string records. This would satisfy both considerations and save valuable computer time required to format records.

Comments regarding the lack of dialogue-like trainee-terminal interaction was a problem only insofar as it had implications for the future systems design. The trainee comments were not in the form of criticism but were questions as to why the lack of the expected give-and-take with the computer. The other comments concerned the frequency and number of anxiety and attitude items. Here, as in the first type of question, it was pointed out that this was an experimental situation in which an attempt was being made to learn

as much in the three-week field study as possible which would have relevance to the model. Included in this was a desire for the trainees to be frank and honest in what they liked, disliked, and, if possible, why. As a consequence, the trainees vocally expressed a desire for more dialogue-like interaction and less of the anxiety and attitude items. These views were taken into consideration in the latest report-proposal to the United States Office of Education titled A Feasibility Study of the Florida State University Model for the Preparation of Elementary School Teachers, December 1969.

Because the overriding concern in the second conceptualization of DATA was for the trainee, formated data on magnetic tape was unavailable to INTERTEC Corporation. Therefore the task data were transmitted on forms to facilitate the keypunching process. As mentioned earlier, this keypunching could be eliminated in the operational system.

Minor problems arose with the CAI Center's IBM 1500 system during the first few days of the field study. These operating problems were resolved by the CAI Center staff. Also, a few trainees had some difficulty operating the terminal during this period. The resource room coordinator's assistance soon relieved these minor problems.

CHAPTER VII

INTERACTION OF THE ELEMENTARY MODEL SYSTEM WITH OTHER UNIVERSITY DATA SYSTEMS

The relationship of the model for training elementary school teachers to the programs of the College of Education and the total university was described in Chapter I in order to set the stage concerning interactions with existing information systems that would have to be considered prior to the implementation of a future subsystem. One immediate obvious interaction which would have to be considered was with the Office of the Registrar in that all sub-elements of the university which are a part of the teaching sector must provide data to this office. Another interaction not quite so obvious or mandatory is the exchange of trainee background data between the model and the Administrative Data Processing files. While the field study did not directly address itself to this matter, it is one which deserves more than a passing note. Therefore, an examination of each of these interactions will follow and in reverse order because the latter interaction would take place before the Office of the Registrar would require any data on the progress of the trainee.

Facilitating the Collection of Trainee Background Information

Each prospective student must submit an application for admission to Florida State University. Most of the data on this document are keypunched and entered into a file and maintained by Administrative Data Processing for the university. These data are held in this file until the student registers at which time the data are transferred to another file of all currently enrolled students. These background data are retained also by the Office of the Registrar on an individual heavy paper record to which quarterly additions are made concerning the courses, credit hours, grades, and quality points.

In the case of the elementary model, all of the background data from the trainee's application for admission could be secured in machine processable form--be it cards, tape, or disk--without any additional keypunching. By coordinating this collection process with Administrative Data Processing and the Office of Admissions, it might be possible to secure additional items of information. However, since the elementary teacher trainees are only one segment of the total university population, the application for admission form would need university-wide acceptance before major changes could be made. But this does not mean that the data collected could not be modified or changed if administrative and academic approvals were secured.

Before changing the admission data collection procedures and forms, it would be appropriate to determine if the Florida Board of Regents plan to implement a statewide form or a centralized applicant

processing scheme. Additionally, the data element dictionary now under development by the Board of Regents for a state university management information system should be examined before any redesign is undertaken.

However, none of these precautions related to the redesign of a form would prevent the movement of those bits of background data on trainees to the model at the time they became identified with this particular training program, or at some regularly scheduled interval. In addition, as changes or corrections were made in either system, they could be relayed as update information to the sister system.

Interaction of the Model with the Data System of the Office of the Registrar

The model has some relatively unique features when compared to the currently maintained student records in the Office of the Registrar. Currently students must accumulate a minimum number of credit hours while maintaining a minimum level of performance in terms of a quality point average in order to remain at or graduate from the institution. In the model's individualized program, there will be a "pass-not pass" grading system which is similar in some respects to the "satisfactory-unsatisfactory" system now in limited operation at Florida State University. However, the major differences lie in the facts that (1) a "not pass" and an "unsatisfactory" are not equivalent evaluations of student performance, and (2) the "satisfactory-unsatisfactory" system limits the number of hours of this type of study that students may carry. Some other differences in the present

operational system and the model must also be examined. For example, the model would theoretically allow a student to receive advanced standing and credit for the tasks passed over because of a demonstrated proficiency in the field. Another example, the traditional grade point average for transcripts, honor organizations, and the computation of class standing would be affected. Consequently, it is obvious that there are many problems to be solved if the model data system is to interact effectively with the Office of the Registrar.

However, these difficulties can be overcome and the model could provide data to the Office of the Registrar if one thinks only about the technical feasibility. But in order to take advantage of this feasibility, certain administrative and academic policy decisions must be made.

Yet it should be understood that interaction of the model with the Office of the Registrar would be no more difficult than with the exchange of background data once a clear set of policy decisions were established. And without these decisions, any attempt for the model to interact with the current concept of student record-keeping would require conversion of the task performances to some grade equivalent, the self-pacing of students would be restricted, and, in short, the individualization and freedom of the student would be seriously curtailed. Therefore, the interaction of the model (while technically feasible) with the current student record-keeping system will be manageable only after clearance has been received to allow this particular element of the university to implement the concepts as described in the proposed model.

CHAPTER VIII

SUMMARY OF FIELD STUDY CONCLUSIONS AND RECOMMENDATIONS

Introduction

Chapter I presented nine questions which had been developed concerning the conceptualized computer management control system for the model. Responses to each of these questions will be presented first. Subsequently, there will be a more general discussion of the field test results. Finally, the specific conclusions and recommendations will be enumerated.

Questions and Responses

1. Is a computer required for such a model? If so, must it be a stand-alone system? What would a total acquisition system probably look like? How much of the total computer processing can be accomplished on the acquisition system which probably will be a small- to medium-sized computer?

The volume of data which 1,000 trainees will produce necessitates the use of a computer. In this researcher's opinion, the stand-alone system is required and should closely follow the proposed system hardware for the model (see Table 14). Also, from the data analyses and discussions with technical personnel who have

investigated the new small-scale computer market, it seems that five of the six major functions can be processed on the small stand-alone system. It is even anticipated that this small computer can assume the sixth function within the next two years if advancement of computer technology continues at its present pace.

2. Should the computer system perform trainee testing? If so, to what extent should this method be employed?

Chapter III (see Figure 4) presents an analysis of the interactions required by incorrect trainee responses. From these data, computer testing of trainees is recommended. However, the extent to which this method should be employed is judgmental. This researcher takes the position that approximately 50 to 60 percent of the enabler tests should be on the computer.

3. What data elements should be collected, and how long should they be retained, for those who

(a) fail to complete a major phase of the program,

(b) fail to complete the total program, and

(c) complete the total program?

In addition to the one-time collection of the trainee transcript and admission data, those elements presented in Table 6 should be collected regularly. As for records retention, summary data of trainees' progress must be retained by the institution indefinitely. This is in order to be able to produce transcripts and to maintain a record of the individual's attendance at the institution. However, these records do not have to remain in an active data processing file.

The length of time that all model data should be retained is open-ended. However, periodic reviews should be established in order that continued assessment of the advantages and disadvantages of retaining these data be made.

4. Who will be the likely users of these data? For what purposes will the data be used? How are reports to be formated so that users can readily make use of the data? Should there be restrictions on the use of the data for research, and who or what group should answer the questions concerning this matter?

The likely users of the data were identified in Chapter IV as counselors, program managers, curriculum designers, and researchers. Descriptions of the sample reports were reported also in relation to how the recipients might use them. As for other uses of the data, there should be some restrictions or guidelines established by the model personnel in line with university policy governing access to these data. A procedure by which one could request access to all or parts of the data will need to be established.

5. What kinds of data will be supplied automatically to the trainee, the counselor, and others? How should these data be organized or formated?

The kinds of data which will be supplied automatically with tentative formats and proposed frequencies were presented in Chapter IV. It is expected that trainees will receive copies of their own progress reports through their counselors. While the formats of the reports

seem to be reasonable, they are to be considered tentative and subject to change as experience will undoubtedly indicate.

6. Should a trainee enter data into the system relating to his own performance on the enablers? If so, can efficient data entry techniques be employed with non-computer oriented trainees?

The question as to whether a trainee should enter data into the system relating to his own enabler performances again requires subjective judgment. This researcher proposes that they should enter these data. During the field study, data entry techniques using the DATA program were employed which demonstrated rather conclusively that non-computer oriented trainees can enter quality data in an efficient manner.

7. Is it practical to employ "on-line" real-time inquiry mode of operations for counselor-trainee weekly scheduling sessions? What interface problems are encountered, and what effect will they have on the system operation?

The employment of "on-line" scheduling for the trainees is considered to be technically feasible and practical. Further, "on-line" scheduling appears to be an essential ingredient for the proper operation of the model. The interface problems between the KSR-35 teletype terminal and the computer in the CAI Center were minimal, but described in detail in Chapter VI. Essentially, the interface problems had no effect upon the field study system. (Do not

confuse this interfacing situation with the one described in Chapter VII--the interface with other university data systems.)

8. What are the major problems encountered during the design, development, and testing of the trial system? How are these problems solved?

In short, there were no major problems encountered during the field study. However, for completeness of documentation, the minor difficulties were described in Chapter VI.

9. How should trainee task performance results be entered into the computerized system? By whom should they be entered? What security precautions should be employed both prior to and after entry into the system? Who can authorize and, under what conditions, will changes be permitted?

Entry of trainee task performance data should make use of the proposed optical scanning equipment. These recording sheets could be preprepared by the trainees prior to a task evaluation session requiring the evaluator to enter only a few marks indicating a trainee's performance. These performance sheets (optical scan forms) should be retained by the evaluator once scored and deposited with the computer center at the close of each day. The computer center operating staff should then update the trainee's task performance file every evening. Changes in a trainee's task performance should be made only after approval by faculty member or the model staff. Retention of the input optical scan forms for one year should provide adequate hard evidence should questions arise on a particular performance score.

General

The primary objective of this element of the field study was to demonstrate that a computer could be used effectively as an acquisition and administrative control system within the Florida State University model to train elementary school teachers and that this demonstration would (1) provide an empirical basis for hardware, personnel, software, and overall costs; (2) highlight the desirability of having some computer management control system, and (3) help identify other areas in which there was a need for further research and investigation.

A review of the literature on computer managed instruction revealed that the technique of modern management control--specifically using computers in education for a variety of assist functions--was very limited. There were only four documented systems found in the review, each of which were briefly described in Chapter I.

This investigation had demonstrated the feasibility of a computer managed instruction system adapted to the particular needs of the Florida State University elementary model. The data acquisition system and techniques employed for this field study were described along with the subsequent analyses and reports generated from these data. And, lastly, the proposed system requirements (hardware, software, personnel, and interface) were based upon empirical data in addition to the combined experience of a number of experts in the field of computer systems and management information needs.

Conclusions

Based upon a review of literature, the field study, and the analyses of these data, the following conclusions have been reached:

1. Modern management techniques in the form of a computer managed instruction system, as previously described, can supply the directors of the elementary model with valuable information upon which to make effective management decisions.
2. Some electronic data processing capability is essential for the elementary model's efficient operation.
3. New small computers are available which could perform the data acquisition, reporting and data processing functions allocated to the proposed small-scale system.
4. On-line scheduling for trainees appears to be feasible and desirable for the currently conceptualized elementary teacher training model.
5. Computerized trainee testing at the enabler level is desirable.
6. Computerized enabler quizzes would reduce the amount of computer time dedicated exclusively to data acquisition.
7. Trainees can enter quality data into a computer system relative to his progress at enabler levels.
8. Technical problems of implementing an on-line data acquisition system are minimal.

Recommendations

It is recommended that:

1. Research be continued on the enlarged computer managed instruction system concept for the elementary model.
2. Serious efforts be directed toward resolution of the interface problems which exist between the current university student record system and the proposed model, consisting of but not limited to
   a. pass-no pass versus current grading and grade point average policies,
   b. advanced standing with credit granted for tasks passed over, and
   c. general and specific maintenance of student records for such purposes as providing transcripts.
3. This investigation and the field study be only the beginning of an undertaking launched to answer some of the more relevant questions concerning our present educational system and of presenting reasonable and practical alternatives instead of criticism as such.

APPENDICES

APPENDIX A

SAMPLE TASK

SAMPLE TASK

Task

To perform this task you will probably need some or all of the following:

Enabler 002: Ability to name some developmental tasks of early childhood and middle childhood. (Example: developing a conscience.)

To acquire this ability you may do any or all of the following options:

Option 101: See file folder on "Developmental Tasks."

Option 201: See Havighurst's Human Development and Education, Chapters 2, 4, 8.

Option 3--: Free Choice.

See resource center attendant for proficiency test.

Enabler 003: Ability to match the different physical, emotional, social and mental growth characteristics to the proper age group. (Example: vocabulary level, span of attention.)

Option 101: See file folder on "Characteristics" and "See How They Grow."

Option 203: View film(s): "Developmental Characteristics of Pre-Adolescents," "Elementary School Children: Part II Discovering Individual Differences," "From Sociable Six to Noisy Nine."

Option 3--: Free Choice.

Sign on CAI terminal and ask for proficiency test.

Enabler 004: Ability to establish rapport with children.

Option 104: Arrange to view a video tape illustrating some techniques of establishing rapport (available in resource center).

Option 206: Attend a seminar or consultation which you may ask for on establishing rapport.

Option 3--: Free Choice.

Sign on CAI terminal and ask for proficiency test.

Enabler 005: Ability to give instructions clearly and concisely and to identify some of the requirements for instruction giving.

Option 101: See card file on "Oral Directions."

Option 208: Practice with a tape recorder and check for clarity and enunciation.

Option 3--: Free Choice (Ask for counseling).

Sign on CAI terminal and ask for the proficiency test.

Enabler 006: Ability to explain how sound identification relates to developing auditory discrimination.

Option 101: Read information in resource center. See card file on "Listening." See Listening Aids Through the Grades.

Option 207: SRA Listening Skills Program, Reel I and Teachers' Guide.

Option 3--: Free Choice.

See resource center attendant for proficiency test.

Source: from U.S. Office of Education, "A Feasibility Study of the Florida State University Model for the Preparation of Elementary School Teachers," pp. 149-150.

APPENDIX B

TRAINEE PARTICIPANTS IN FIELD STUDY

TRAINEE PARTICIPANTS IN FIELD STUDY

Trainee	Trainee number	Social security number
Olson, Joanne	t001	267-84-9675
Osborne, Betsy Ellen	t002	261-02-8291
Flummer, Barbara	t003	264-34-0422
Prater, Mary	t004	261-84-2533
Randle, Caroline Lee	t005	265-02-2608
Reed, Susan	t006	262-96-9335
Reser, Kathleen	t007	262-98-7822
Sayers, Marcia Lynn	t008	262-96-8618
Searcy, Judith	t009	267-76-0300
Seuss, Carolyn E.	t010	263-90-9639
Shelton, Alice Elaine	t011	308-50-3475
Shuman, Susanne	t012	262-84-6508
Small, Susan	t013	263-82-2436
Spano, Patricia	t014	266-94-7581
Stephens, Marcia	t015	261-02-1618
Stephenson, Mary	t016	261-82-1181
Stock, Diane	t017	262-88-7750
Thibault, James	t018	266-88-8223
Thrower, Kathy	t019	263-02-8644

APPENDIX C

TASK DATA SHEET

TASK DATA SHEET

COUNSELOR _____

SOCIAL SECURITY NUMBER _____ STUDENT NAME _____
****

TASK NUMBER _____ DATE TASK ASSIGNED (modayr) _____
*** *******

DATE - EXPECTED COMPLETION (modayr) _____
****

ENABLER ***	RES.OPT. & MEDIA CODE ****	STUDY TIME **.*	SCORE (00-99) **	DATE ENTERED COMPUTER *******
		.		
		.		
		.		
		.		
		.		
		.		
		.		
		.		
		.		
		.		

TASK EVALUATION DATE _____ GIVEN BY _____ SCORE ____
******* **

TASK EVALUATION DATE _____ GIVEN BY _____ SCORE ____
******* **

TASK EVALUATION DATE _____ GIVEN BY _____ SCORE ____
******* **

COMMENTS _____

_____

For additional comments check this box ☐ and write on reverse side.

APPENDIX D

RESOURCE MEDIA OPTIONS CODE

RESOURCE MEDIA OPTIONS CODE

00	Miscellaneous
01	Resource Center written materials
02	FSU library materials
03	16 mm. film(s)
04	Prepared VTR
05	Instructional seminar
06	Consultation (individual or small group)
07	Audio tape
08	Practice with AV equipment
09	Practice with pupils
10	Students textbooks
11	Social studies materials
12	Proficiency test
13	Task oriented lecture
14	Teaching aids

	Must Do Both
21	Filmstrip and audio tape
22	Filmstrip, audio tape, Resource Center materials
23	FSU library, Resource Center, audio tape
24	Instructional seminar and VTR
25	Seminar and write questions and VTR and discussion
26	Video tape and Resource Center materials

APPENDIX E

SAMPLE FROM DATA PROGRAM AS SEEN BY THE TRAINEE

SAMPLE FROM DATA PROGRAM AS SEEN BY THE TRAINEE

YOU HAVE BEEN SIGNED ON.

WHAT IS YOUR SOCIAL SECURITY NUMBER? ENTER 9 NUMERIC DIGITS WITH NO SPACING BEFORE OR BETWEEN THE NUMBERS.

222222222

I'M SORRY BUT I HAVE NO RECORD THAT THIS IS THE SOCIAL SECURITY NUMBER OF ONE OF THE TRAINEES. I SUGGEST THAT YOU EXAMINE THE NUMBER YOU ENTERED TO BE SURE IT IS CORRECT AND THAT YOU HAD NO SPACING BEFORE OR BETWEEN ANY OF THE NUMERIC DIGITS. WHEN THIS IS DONE, TRY AGAIN.

256748575

ENTER THE TASK NUMBER. THREE NUMERIC DIGITS.

003

HAS ENABLER INFORMATION REGARDING THIS TASK BEEN ENTERED PREVIOUSLY?

YE

WHAT IS THE NUMBER OF THE ENABLER?

002

WHAT IS THE RESOURCE OPTION-MEDIA CODE?

224

HOW MUCH TIME IN HOURS (MINUTES IN TENTHS) DID YOU SPEND ON THIS ENABLER OPTION? ENTER ONLY THE THREE DIGITS. DO NOT ENTER THE DECIMAL.

005

WHAT SCORE DID YOU MAKE ON THIS ENABLER OPTION? THE FIRST TWO DIGITS YOU ENTER WILL BE CONSIDERED YOUR SCORE.

85

DO YOU HAVE OTHER ENABLER INFORMATION TO ENTER RELATED TO THIS SAME TASK?

NO

DO YOU WANT TO ENTER SOME INFORMATION ON ANOTHER TASK?

YE

ENTER THE TASK NUMBER. THREE NUMERIC DIGITS.

004

HAS ENABLER INFORMATION REGARDING THIS TASK BEEN ENTERED PREVIOUSLY?

NO

PLEASE ENTER THE SCHEDULED START DATE (SIX NUMERIC DIGITS).

090769

CHECK YOUR LAST ENTRY--OCTOBER = 10 WHILE 1969 IS ABBREVIATED TO 69. THEREFORE YOUR SCHEDULED START DATE SHOULD BE 10 "BLANK" "BLANK" 69. ENTER THE SCHEDULED START DATE AGAIN.

100769

WHAT IS THE EXPECTED COMPLETION DATE FOR THIS TASK?

100869

WHAT IS THE NUMBER OF THE ENABLER?

001

WHAT IS THE RESOURCE OPTION-MEDIA CODE?

103

HOW MUCH TIME IN HOURS (MINUTES IN TENTHS) DID YOU SPEND ON THIS ENABLER OPTION? ENTER ONLY THE THREE DIGITS. DO NOT ENTER THE DECIMAL.

010

WHAT SCORE DID YOU MAKE ON THIS ENABLER OPTION? THE FIRST TWO DIGITS YOU ENTER WILL BE CONSIDERED YOUR SCORE.

99

DO YOU HAVE OTHER ENABLER INFORMATION TO ENTER RELATED TO THIS SAME TASK?

YE

WHAT IS THE NUMBER OF THE ENABLER?

003

WHAT IS THE RESOURCE OPTION-MEDIA CODE?

207

HOW MUCH TIME IN HOURS (MINUTES IN TENTHS) DID YOU SPEND ON THIS ENABLER OPTION? ENTER ONLY THE THREE DIGITS. DO NOT ENTER THE DECIMAL.

002

WHAT SCORE DID YOU MAKE ON THIS ENABLER OPTION? THE FIRST TWO DIGITS YOU ENTER WILL BE CONSIDERED YOUR SCORE.

78

DO YOU HAVE OTHER ENABLER INFORMATION TO ENTER RELATED TO THIS SAME TASK?

NO

DO YOU WANT TO ENTER SOME INFORMATION ON ANOTHER TASK?

NO

THE FOLLOWING STATEMENTS WERE MADE BY SOME STUDENTS DESCRIBING THE WAY THEY FELT WHILE THEY WERE WORKING ON THE SECTION YOU HAVE JUST COMPLETED. PRESS THE SPACE BAR TO CONTINUE.

I AM TENSE.

1. NOT AT ALL 2. SOMEWHAT
3. MODERATELY SO 4. VERY MUCH SO

TYPE THE NUMERAL AT THE LEFT OF THE STATEMENT TO INDICATE HOW YOU FELT.

1

I FEEL AT EASE.

1. NOT AT ALL 2. SOMEWHAT
3. MODERATELY SO 4. VERY MUCH SO

4

I AM RELAXED.

1. NOT AT ALL 2. SOMEWHAT
3. MODERATELY SO 4. VERY MUCH SO

4

I AM JITTERY.

1. NOT AT ALL
2. SOMEWHAT
3. MODERATELY SO
4. VERY MUCH SO

1

I FEEL CALM.

1. NOT AT ALL
2. SOMEWHAT
3. MODERATELY SO
4. VERY MUCH SO

4

SELECT FROM THE MULTIPLE CHOICE OPTIONS THAT FOLLOW THE RESPONSE WHICH BEST DESCRIBES YOU IN RELATION TO THE STATEMENT PRESENTED. SPACE TO CONTINUE.

I LEARN BEST BY WORKING CLOSELY AND DIRECTLY WITH THE TEACHER.

1. VERY PROBABLE
2. PROBABLE
3. UNDECIDED
4. PROBABLY NOT
5. MOST PROBABLY NOT

2

WHENEVER I HAVE TO OPERATE A MACHINE, I BECOME NERVOUS.

1. VERY PROBABLE
2. PROBABLE
3. UNDECIDED
4. PROBABLY NOT
5. MOST PROBABLY NOT

5

I PREFER TO STUDY A PARTICULAR COURSE AT A REGULARLY SCHEDULED TIME RATHER THAN VARY THE TIME TO FIT MY NEEDS AND INCLINATIONS.

1. VERY PROBABLE
2. PROBABLE
3. UNDECIDED
4. PROBABLY NOT
5. MOST PROBABLY NOT

4

WHEN I'M LEARNING A NEW SUBJECT, I LIKE TO SKIP AROUND AND LET MY INTERESTS LEAD THE WAY RATHER THAN PROCEED THROUGH IT ON A STEP BY STEP BASIS.

1. VERY PROBABLE
2. PROBABLE
3. UNDECIDED
4. PROBABLY NOT
5. MOST PROBABLY NOT

4

THE IDEAL LEARNING SITUATION INVOLVES ONE STUDENT AND ONE TEACHER.

1. VERY PROBABLE
2. PROBABLE
3. UNDECIDED
4. PROBABLY NOT
5. MOST PROBABLY NOT

3

YOU HAVE BEEN SIGNED OFF.

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